United States Department of Agriculture

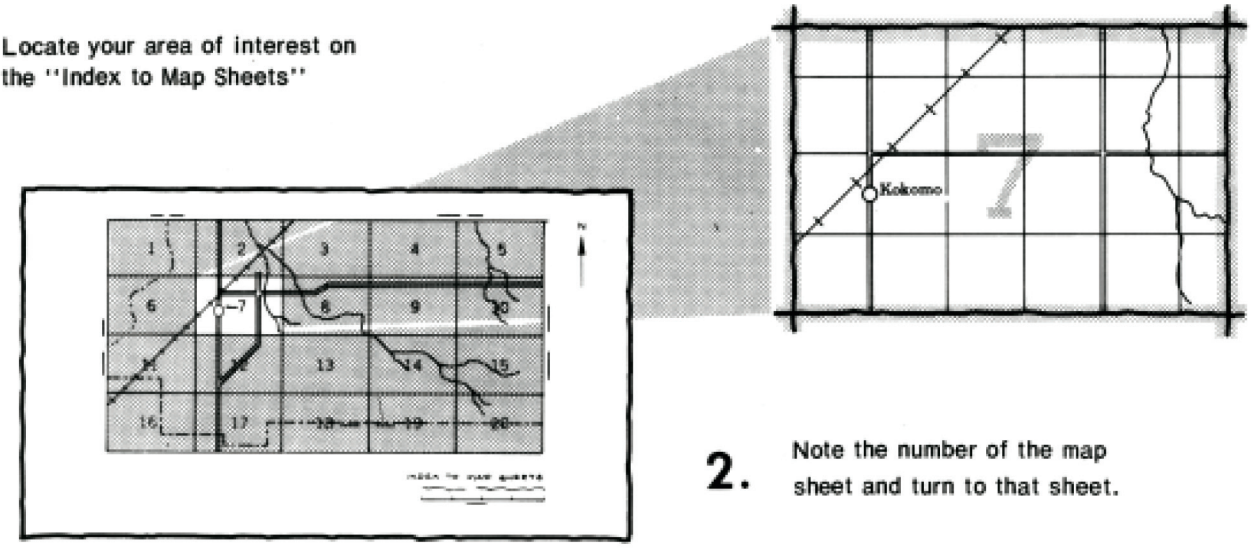
Soil Conservation Service

In Cooperation with the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Department of Soil Conservation, State of Iowa

Soil Survey of Des Moines County Iowa

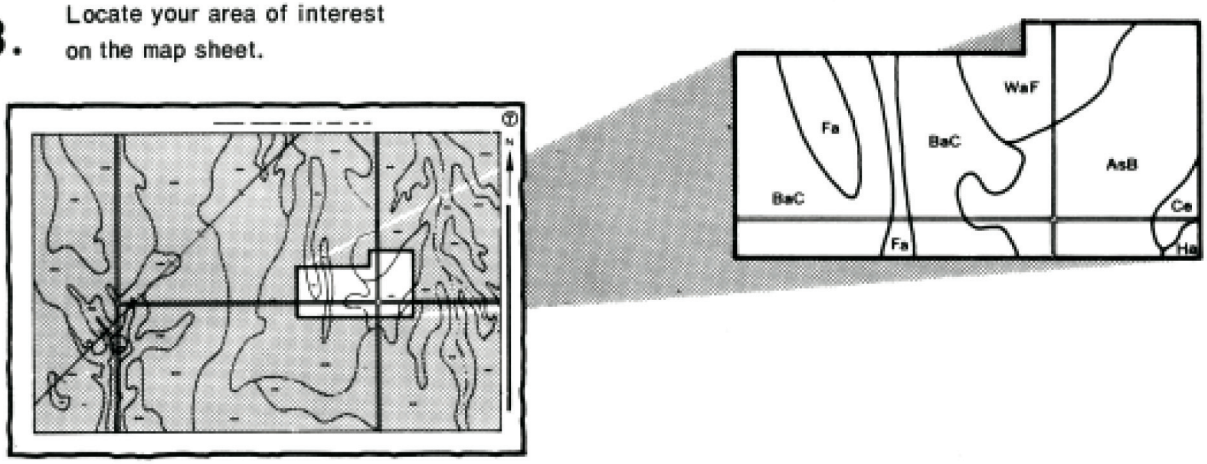
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

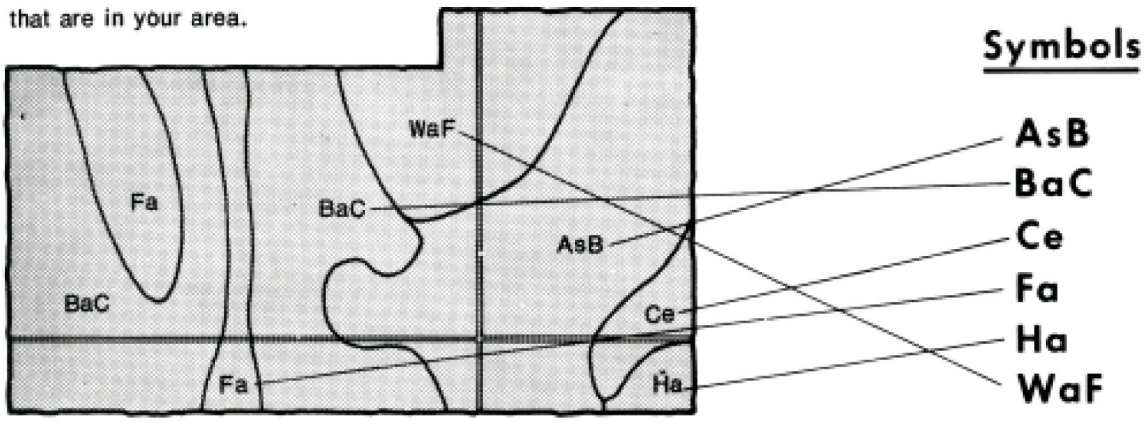


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

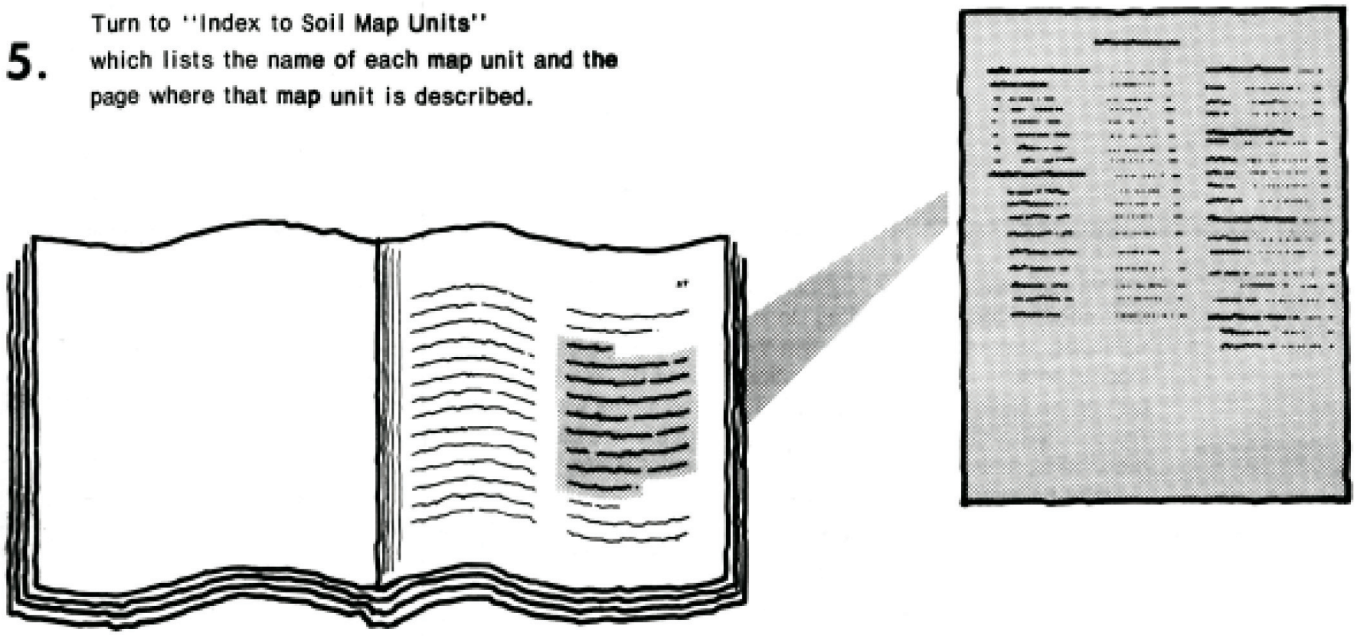


4. List the map unit symbols that are in your area.

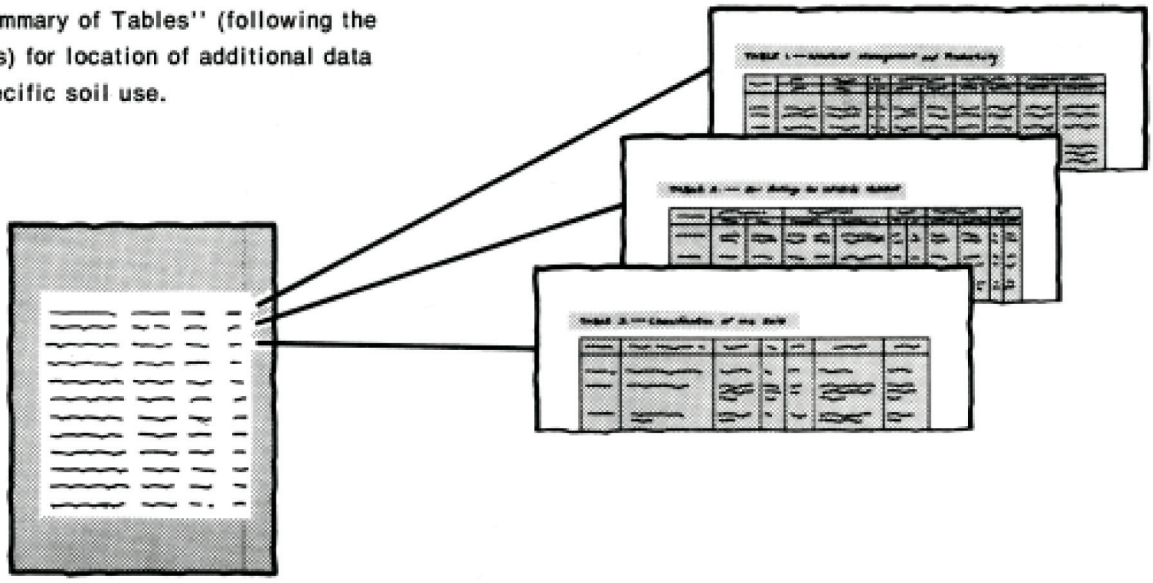


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This survey was made cooperatively by the Soil Conservation Service; the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Department of Soil Conservation, State of Iowa. It is part of the technical assistance furnished to the Des Moines County Soil Conservation District. Funds appropriated by Des Moines County were used to defray part of the cost of the survey.

Major fieldwork was performed in the period 1975-79. Soil names and descriptions were approved in 1980. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Typical area of the Mahaska-Taintor association.

contents

soil series

Issued May 1983

index to map units

summary of tables

preface

This soil survey contains information that can be used in land-planning programs in Des Moines County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations inherent in the soil or hazards that adversely affect the soil, improvements needed to overcome the limitations or reduce the hazards, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

soil survey of
Des Moines County, Iowa

By Melvin D. Brown, Soil Conservation Service

Fieldwork by Melvin D. Brown, Bennie Clarks, Jr., and Richard A. Lensch, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service,
in cooperation with the
Iowa Agriculture and Home Economics Experiment Station;
the Cooperative Extension Service, Iowa State University;
and the Department of Soil Conservation, State of Iowa

DES MOINES COUNTY is in southeast Iowa (fig. 1). It is bordered on the east by the Mississippi River and on the south by the Skunk River. In 1970, it had a population of 46,982. Burlington, the county seat, had a population of 32,366. More than 65 percent of the total population of the county lived in Burlington. About 20 percent lived on farms.

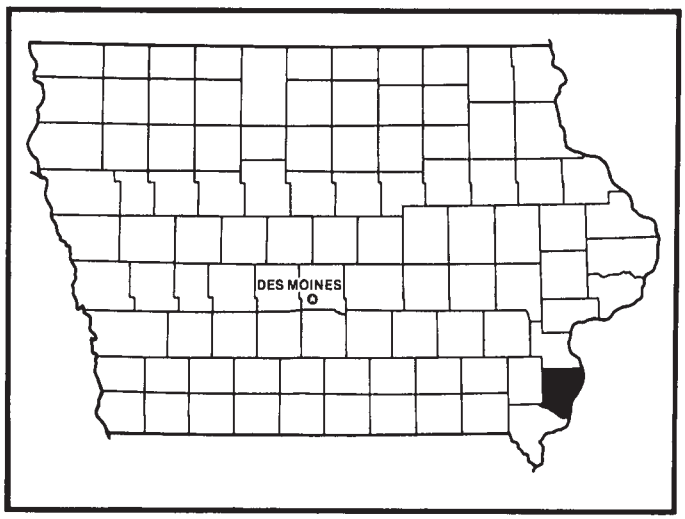


Figure 1.—Location of Des Moines County in Iowa.

Des Moines County has an area of about 261,760 acres, or 409 square miles. About 60 percent of the county is cropland; 10 percent urban land; 8 percent pasture; and 22 percent woodland, wasteland, or idle land. Growing soybeans and corn for grain and seed, feeding cattle, and raising hogs are the principal farming enterprises.

Des Moines County is on a loess-covered glacial till plain. The soils formed under prairie and forest vegetation. The nearly level and gently sloping soils in the uplands formed in loess. The native vegetation in these areas was grass. The soils in the steeper areas formed in glacial till. The native vegetation in these areas was trees. The nearly level and gently sloping soils on bottom land along the Mississippi and Skunk Rivers formed in alluvium. The native vegetation in these areas was trees.

This survey updates the soil survey of Des Moines County published in 1925 (*3*). It provides additional information and larger maps, which show the soils in more detail.

general nature of the county

The paragraphs that follow describe the history, farming, transportation facilities, climate, relief, and drainage of the county.

history

Des Moines County was part of the Michigan Territory at one time. In 1833, a settlement near the present site of Burlington was established. In 1836, when the first census was taken, the population of Des Moines County was 6,257. The first county seat was at Flint Hills. The name was later changed to Burlington.

During the 1840's, steamboats traveled the Mississippi River carrying goods and people into and out of Des Moines County. A network of stagecoach lines also carried passengers throughout the county. In 1854, the county had its first railroad service. By 1868, a railroad bridge spanned the Mississippi River at Burlington, and by 1871, seven railroad lines provided transportation for farm products.

farming

Farming is of prime importance in Des Moines County. It is a vital part of the total ecomomy. It provides a livelihood not only for farmers, but also for many businesses and professions involved in agribusiness activities.

Des Moines County has an area of 261,760 acres, or 409 square miles of land. Of this total, about 165,000 acres is tillable. Corn and soybeans are the main row crops. In 1976, the county had 910 farms, which averaged about 244 acres in size. The number of farms has been decreasing while the average size has been increasing. The age of the farm operator has also been decreasing. Fewer and larger farms account for a part of the overall increased production, but increased efficiency also has much to do with farm output.

transportation facilities

Three major highways serve Des Moines County. U.S. Highway No. 34, traversing the county dominantly east and west, and U.S. Highway No. 61, traversing north and south, intersect at Burlington. State Highway No. 99, traversing north and south, begins at Burlington and ends at Wapello, in Louisa County. Hard surface roads connect these highways to nearly all of the smaller communities in the county. Roads of crushed limestone or gravel pass by nearly all farmsteads.

Two railroad lines serve Des Moines County. One traverses east and west through the southern part of the county, and one begins at Burlington and traverses north and south. Bus service, an airport, and Amtrak rail service also are available at Burlington.

Motor freight lines serve every trading center in the county. Other transportation facilities include barges on the Mississippi River. Much of the grain in the county is carried to major terminals on these barges.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Des Moines County is cold in winter and is quite hot with occasional cool spells in summer. During the winter precipitation frequently occurs as snowstorms, and during the warm months it is chiefly rain, often heavy, when warm moist air moves in from the south. Total annual rainfall is normally adequate for corn, soybeans, and small grain.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Burlington, Iowa, in the period 1965 to 1977. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 25 degrees F, and the average daily minimum temperature is 17 degrees. The lowest temperature on record, which occurred at Burlington on January 17, 1977, is -23 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 83 degrees. The highest recorded temperature, which occurred at Burlington, Iowa, on July 18, 1966, is 101 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 36 inches. Of this, 23 inches, or about 65 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 3.44 inches at Burlington on August 4, 1977. Thunderstorms occur on about 51 days each year, and most occur in summer.

Average seasonal snowfall is about 25 inches. The greatest snow depth at any one time during the period of record was 14 inches. On an average of 34 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 75 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 12 miles per hour, in spring.

Tornadoes and severe thunderstorms occur occasionally. They are usually of local extent and of short duration, and the resulting damage is sparse and in narrow belts. Hail falls at times during the warmer part of the year in scattered small areas.

relief

The highest point of elevation in the county, 862 feet above sea level, is about 3 miles southwest of Yarmouth. The lowest elevation, about 520 feet above sea level, is at a point where the Skunk River enters the Mississippi River at the southeastern boundary of the county.

The vertical interval between the lowlands and the adjoining uplands generally ranges from 50 to 120 feet. The vertical interval between the water level of the Mississippi River and the divides, however, gradually increases to more than 240 feet. Above Lock and Dam No. 18, much of the river bottom land is below the level of the Mississippi River. The broad areas between streams are nearly level. In parts of the county, the broad divides also are nearly level. Areas near the flood plains of the larger streams are dissected by many short, steep drainageways. In many of these areas there is a tabletop appearance with little or no transition from the nearly level ridgetops to the very steep side slopes of the drainageways.

drainage

Two major rivers receive almost all of the runoff in Des Moines County. Nearly 67 percent of the county is drained by the Mississippi River and its smaller tributaries; 27 percent by the Skunk River and its tributaries; and, in a small area along the northern edge of the county, 6 percent by the Iowa River, in Louisa County.

Cedar Creek, Long Creek, and Brush Creek flow south into the Skunk River. Several small creeks flow north into the Iowa River. Flint Creek and Spring Creek flow directly into the Mississippi River. Yellow Spring Creek, Hawkeye Creek, and Dolby Creek drain into bottom land diversion ditches, which carry the water to the Mississippi River.

The bottom land along the Mississippi River is at or near the normal elevation of the river or in some areas is below the river level. It is protected from flooding by a levee just north of Burlington, which extends north into Louisa County. Much of the acreage is drained by an extensive system of drainage ditches. These drainage ditches lead to three large pumping stations, where the water is pumped over the levee and into the river.

Many of the soils on the bottom land would have a high water table in their natural condition. The drainage system, however, lowers the water table to a depth of 6 feet, and the large pumping stations keep the water table from rising back to its natural level.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each association is a unique natural landscape. Typically, it consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

soil descriptions

1. Wabash-Titus-Dolbee association

Nearly level, very poorly drained and poorly drained, silty and clayey soils on bottom land

This association is along the major rivers and on the wide flood plain between the uplands and the Mississippi River. It is characterized by an extensive system of drainage ditches and diversion ditches. The trees on this association generally are in groves or windbreaks near the farmsteads. The soils formed in alluvium. Slopes range from 0 to 2 percent.

This association makes up about 14 percent of the county. It is about 19 percent Wabash and similar soils, 17 percent Titus and similar soils, 15 percent Dolbee and similar soils, and 49 percent minor soils.

Dolbee and Titus soils are poorly drained and Wabash soils very poorly drained. All three soils are on flood plains.

Typically, the surface layer of the Wabash soils is black silty clay about 7 inches thick. The subsurface layer is black silty clay about 11 inches thick. The subsoil to a depth of about 60 inches is mottled silty clay. It is black and very dark gray and very firm in the upper part and dark gray and dark grayish brown and firm in the lower part.

Typically, the surface layer of the Titus soils is black silty clay loam about 8 inches thick. The subsurface layer is very dark gray, mottled silty clay loam about 14 inches thick. The subsoil to a depth of about 60 inches is dark gray, mottled, firm silty clay loam.

Typically, the surface layer of the Dolbee soils is black silt loam about 8 inches thick. The subsurface layer is black and very dark gray, mottled silt loam about 10 inches thick. The subsoil to a depth of about 60 inches is mottled, friable silty clay loam. It is very dark gray in the upper part and dark gray in the lower part.

Minor in this association are the poorly drained or somewhat poorly drained Ackmore soils on alluvial fans and flood plains; the poorly drained Coland and Zook and somewhat poorly drained Shaffton soils on flood plains; the somewhat poorly drained Elrin and Hoopeston soils on terraces; the moderately well drained Klum soils on flood plains and alluvial fans; and the somewhat poorly drained to very poorly drained, frequently flooded Fluvaquents on the lower flood plains.

Most of this association is used for cultivated crops, mainly corn and soybeans for cash. The soils are moderately suited or well suited to all of the cultivated crops commonly grown in the county. The main concerns of management are wetness and flooding. Much of this association is subject to rare flooding even though it is protected by levees along the Mississippi River. Much of the acreage is drained by tile and by drainage ditches, which lead to pumping stations, where the water is moved over the levees and into the river. In many areas additional surface and subsurface drainage measures are needed.

2. Nodaway-Lawson-Klum association

Nearly level, moderately well drained and somewhat poorly drained, loamy and silty soils on bottom land

This association is in narrow to moderately wide valleys of major and minor streams (fig. 2). The soils formed in silty and loamy alluvium. Slopes generally range from 0 to 2 percent.

This association makes up about 7 percent of the county. It is about 20 percent Nodaway and similar soils, 14 percent Lawson and similar soils, 10 percent Klum and similar soils, and 56 percent minor soils.

Nodaway and Klum soils are moderately well drained and Lawson soils somewhat poorly drained. All three soils are on flood plains.

Figure 2.—An area of Nodaway and Lawson soils in the Nodaway-Lawson-Klum association. Nodaway soils are near the stream channel and Lawson soils farther away.

Typically, the surface layer of the Nodaway soils is very dark grayish brown silt loam about 10 inches thick. The substratum to a depth of about 60 inches is stratified very dark grayish brown, dark grayish brown, very dark gray, and grayish brown, mottled silt loam and silty clay loam.

Typically, the surface layer of the Lawson soils is very dark brown silt loam about 8 inches thick. The subsurface layer is very dark brown and black silt loam about 26 inches thick. The substratum to a depth of about 60 inches is stratified dark brown, very dark grayish brown, and dark grayish brown, mottled silt loam.

Typically, the surface layer of the Klum soils is very dark grayish brown fine sandy loam about 8 inches thick. The substratum to a depth of about 60 inches is stratified very dark grayish brown to grayish brown and brown sandy loam, loam, fine sandy loam, and silt loam.

The more extensive minor soils in this association are the poorly drained Colo soils on flood plains; the somewhat poorly drained Cantril soils on foot slopes and alluvial fans; the somewhat poorly drained and poorly drained Coppock and Vesser soils on foot slopes, low stream terraces, and alluvial fans; and the somewhat poorly drained to very poorly drained, frequently flooded Fluvaquents on the lower flood plains. Other minor soils, on stream terraces, are the well drained Bertrand and Bolan soils, the well drained and somewhat excessively drained Dickinson soils, and the excessively drained Sparta soils.

Most of this association is used for row crops or hay and pasture or is left idle. Areas adjacent to the Mississippi and Skunk Rivers, however, support native trees or scrub vegetation. Much of this association is subject to flooding, but some of the soils are partially protected by a low levee. The soils on benches are above the normal flood level.

Most of the soils of this association are well suited or moderately suited to all of the cultivated crops commonly grown in the county. The chief enterprises are growing corn and soybeans for cash and feeding beef cattle. The main management needs are measures that control flooding and soil blowing and maintain tilth and fertility.

3. Nira-Otley-Mahaska association

Nearly level to moderately sloping, moderately well drained and somewhat poorly drained, silty soils on uplands

This association is on moderately wide or wide ridgetops and short, convex or plane side slopes. The trees on this association are in groves or windbreaks near the farmsteads. The soils formed in loess. Slopes generally range from 1 to 9 percent.

This association makes up about 8 percent of the county. It is about 35 percent Nira soils, 30 percent Otley soils, 15 percent Mahaska soils, and 20 percent minor soils (fig. 3).

Nira and Otley soils are moderately well drained and are gently sloping and moderately sloping. Nira soils are on side slopes. Otley soils are on ridgetops and side slopes. Mahaska soils are somewhat poorly drained and are nearly level. They are on ridgetops.

Typically, the surface layer of the Nira soils is black silty clay loam about 8 inches thick. The subsurface layer is very dark grayish brown silty clay loam about 6 inches thick. The subsoil is mottled, friable silty clay loam about 32 inches thick. The upper part is brown, the next part is dark grayish brown and olive gray, and the lower part is grayish brown. The substratum to a depth of about 60 inches is grayish brown, mottled silty clay loam.

Typically, the surface layer of the Otley soils is very dark brown silty clay loam about 6 inches thick. The subsurface layer is very dark brown and dark brown silty clay loam about 8 inches thick. The subsoil is about 35 inches thick. It is brown, friable silty clay loam in the upper part; brown, mottled, firm silty clay loam in the next part; and grayish brown, yellowish brown, and dark

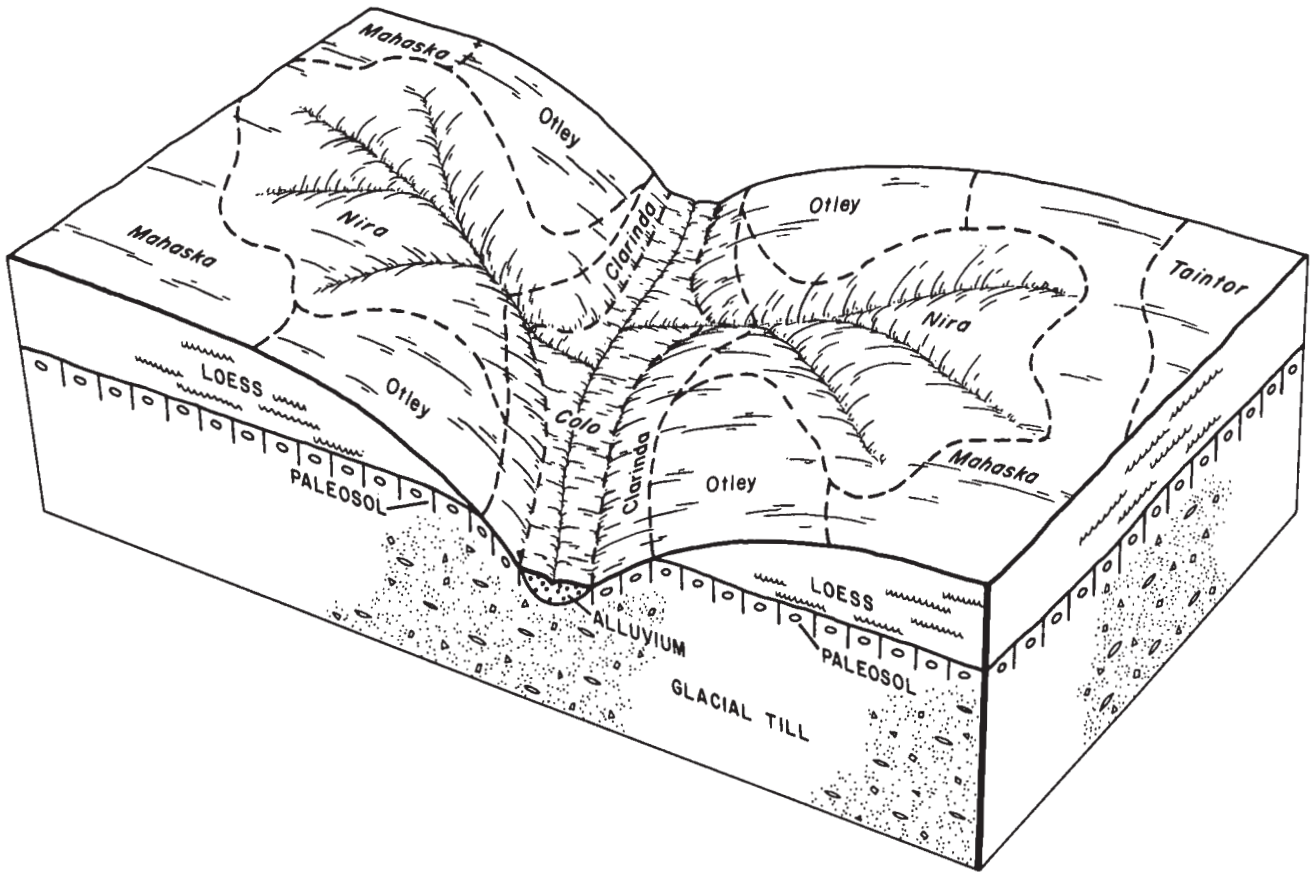


Figure 3.—Typical pattern of soils and parent materials in the Nira-Otley-Mahaska association.

grayish brown mottled, friable silty clay loam in the lower part. The substratum to a depth of about 60 inches is dark grayish brown, brown, and strong brown, mottled silty clay loam.

Typically, the surface layer of the Mahaska soils is black silty clay loam about 10 inches thick. The subsurface layer is black and very dark grayish brown silty clay loam about 8 inches thick. The subsoil is friable silty clay loam. The upper part is very dark grayish brown, and the next part is dark grayish brown and mottled. The lower part to a depth of about 60 inches is mottled grayish brown and yellowish brown.

Minor in this association are the poorly drained Colo soils in drainageways; the poorly drained and very poorly drained Sperry soils in slight depressions; the poorly drained Taintor soils on upland divides; and the poorly drained Clarinda soils in coves at the head of drainageways and on the lower side slopes.

Most of this association is used for cultivated crops. The more sloping areas are used for pasture.

The soils of this association are well suited or moderately suited to all of the cultivated crops commonly grown in the county. The chief enterprises are growing corn and soybeans for cash and feeding beef cattle. The main management needs are measures that control erosion and maintain tilth and fertility.

4. Mahaska-Taintor association

Nearly level, somewhat poorly drained and poorly drained, silty soils on uplands

This association is on moderately wide or wide ridgetops characterized by a lack of well defined drainageways. The trees on this association generally are in groves or windbreaks near the farmsteads. The soils formed in loess. Slopes range from 0 to 3 percent.

This association makes up about 20 percent of the county. It is about 48 percent Mahaska soils, 42 percent Taintor soils, and 10 percent minor soils (fig. 4).

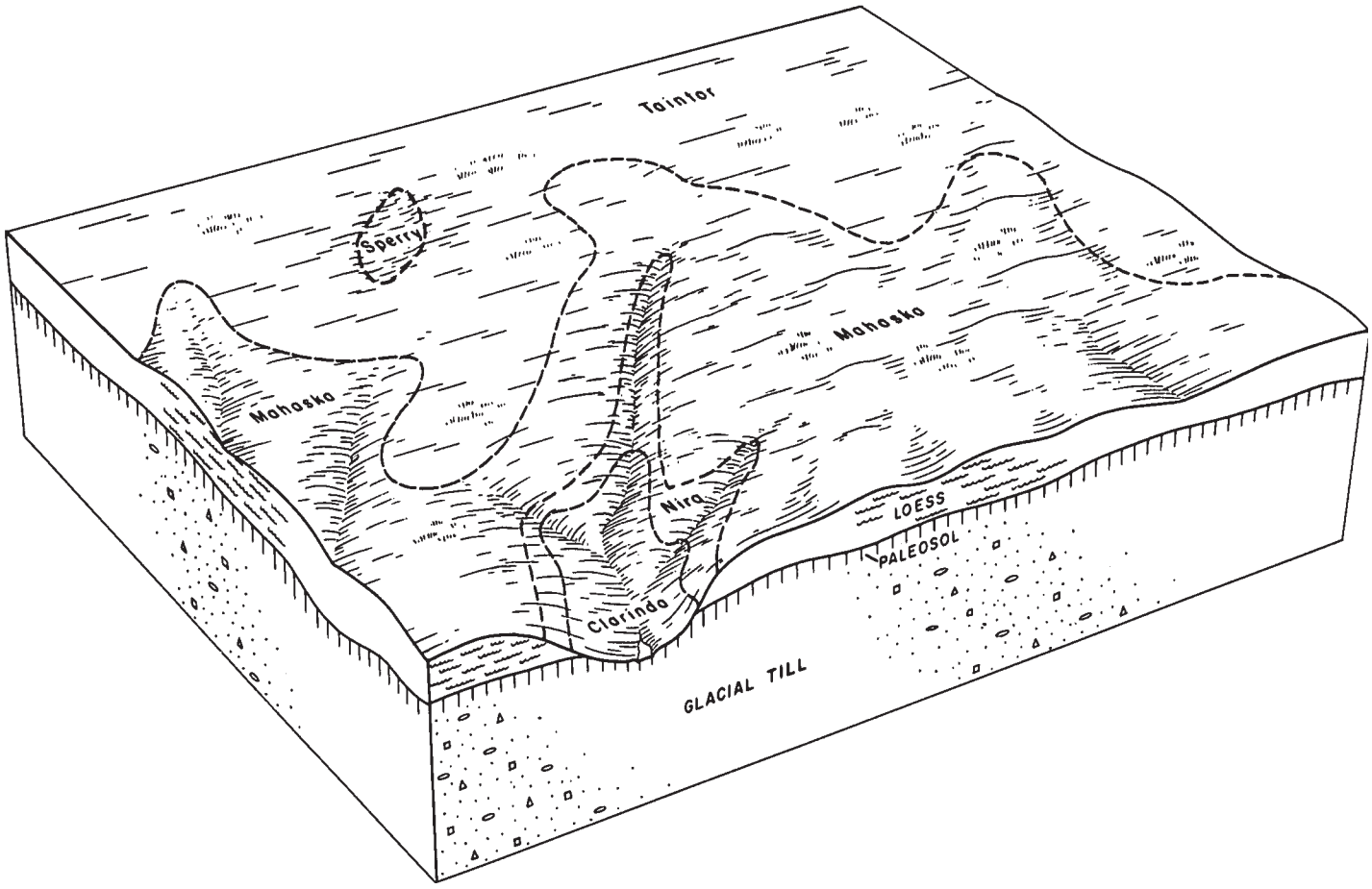


Figure 4.—Typical pattern of soils and parent materials in the Mahaska-Taintor association.

Figure 5.—A cultivated area of Taintor silty clay loam in the Mahaska-Taintor association.

Mahaska soils are somewhat poorly drained and Taintor soils poorly drained. Both soils are on ridgetops in the uplands.

Typically, the surface layer of the Mahaska soils is black silty clay loam about 10 inches thick. The subsurface layer is black and very dark grayish brown silty clay loam about 8 inches thick. The subsoil is friable silty clay loam. The upper part is very dark grayish brown, and the next part is dark grayish brown and mottled. The lower part to a depth of about 60 inches is mottled grayish brown and yellowish brown.

Typically, the surface layer of the Taintor soils is black silty clay loam about 8 inches thick. The subsurface layer is black, mottled silty clay loam about 15 inches thick. The subsoil is mottled silty clay loam about 29 inches thick. The upper part is dark grayish brown and firm, and the lower part is olive gray and friable. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam.

Minor in this association are the poorly drained Clarinda soils in coves at the head of drainageways and on the lower side slopes; the moderately well drained Nira soils on the upper side slopes; the poorly drained or very poorly drained Sperry soils in slight depressions; and the somewhat poorly drained Givin soils at the edges of the narrower ridgetops.

Almost all of this association is used for cultivated crops, mainly corn and soybeans for cash (fig. 5). Little is used for pasture. Much of the urban expansion in the county is taking place in this association (fig. 6). The soils are well suited to all of the cultivated crops commonly grown in the county. The main management needs are measures that control the wetness and maintain tilth and fertility.

5. Clinton-Lindley association

Gently sloping to very steep, moderately well drained and well drained, loamy and silty soils on uplands and high stream benches

Figure 6.—Encroachment of an urban area in the Mahaska-Taintor association.

This association is on the narrow, rounded tops of ridges and on side slopes. It is characterized by a well developed network of drainageways. The soils formed in loess and glacial till. Slopes range from 2 to 40 percent.

This association makes up about 32 percent of the county. It is about 45 percent Clinton soils, 25 percent Lindley soils, and 30 percent minor soils (fig. 7).

Clinton soils are moderately well drained and are gently sloping to strongly sloping. They are on ridgetops and side slopes (fig. 8). Lindley soils are well drained and are strongly sloping to very steep. They are on side slopes.

Typically, the surface layer of the Clinton soils is dark brown silt loam about 8 inches thick, except where eroded. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is dark yellowish brown silty clay loam about 34 inches thick. The upper part is friable, the next part is mottled and firm, and the lower part is mottled and friable. The substratum to a depth of about 60 inches is multicolored silty clay loam.

Typically, the surface layer of the Lindley soils is very dark grayish brown loam about 3 inches thick. The subsurface layer is brown loam about 4 inches thick. The upper part of the subsoil is yellowish brown, friable loam, and the next part is yellowish brown, mottled, firm clay loam. The lower part to a depth of about 60 inches is yellowish brown and strong brown, mottled, firm clay loam.

Minor in this association are the well drained Fayette and moderately well drained Keswick soils on side slopes; the moderately well drained Klum and Nodaway and somewhat poorly drained Cantril soils in drainageways; the moderately well drained Inton soils in coves at the head of upland drainageways; and the

somewhat poorly drained Keomah soils on upland divides.

Most of the less sloping areas in this association are used for cultivated crops. The more sloping areas are used for permanent pasture or support timber.

The less sloping soils of this association are well suited or moderately suited to all of the cultivated crops commonly grown in the county. The chief enterprises are growing corn and soybeans for cash and feeding beef cattle and hogs. The number of farms is decreasing, and many abandoned farmsteads are evident (fig. 9). The main management needs are measures that control erosion and maintain or improve fertility and tilth.

6. Givin-Hedrick-Ladoga association

Nearly level to moderately sloping, somewhat poorly drained and moderately well drained, silty soils on uplands

This association is on moderately wide ridgetops and short, convex or plane side slopes characterized by a well developed network of drainageways. The trees on this association generally are in groves or windbreaks near the farmsteads or are along drainageways in the more sloping areas. The soils formed in loess. Slopes range from 1 to 9 percent.

This association makes up about 16 percent of the county. It is about 35 percent Givin soils, 25 percent Hedrick soils, 20 percent Ladoga soils, and 20 percent minor soils (fig. 10).

Givin soils are somewhat poorly drained and are nearly level. They are on ridgetops. Hedrick and Ladoga soils are moderately well drained and are gently sloping and moderately sloping. Hedrick soils are on side slopes. Ladoga soils are on ridgetops and side slopes.

Typically, the surface layer of the Givin soils is very dark brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown, mottled silt loam about 4 inches thick. The subsoil is mottled, friable and firm silty clay loam about 36 inches thick. The upper part is dark grayish brown, grayish brown, and brown, and the

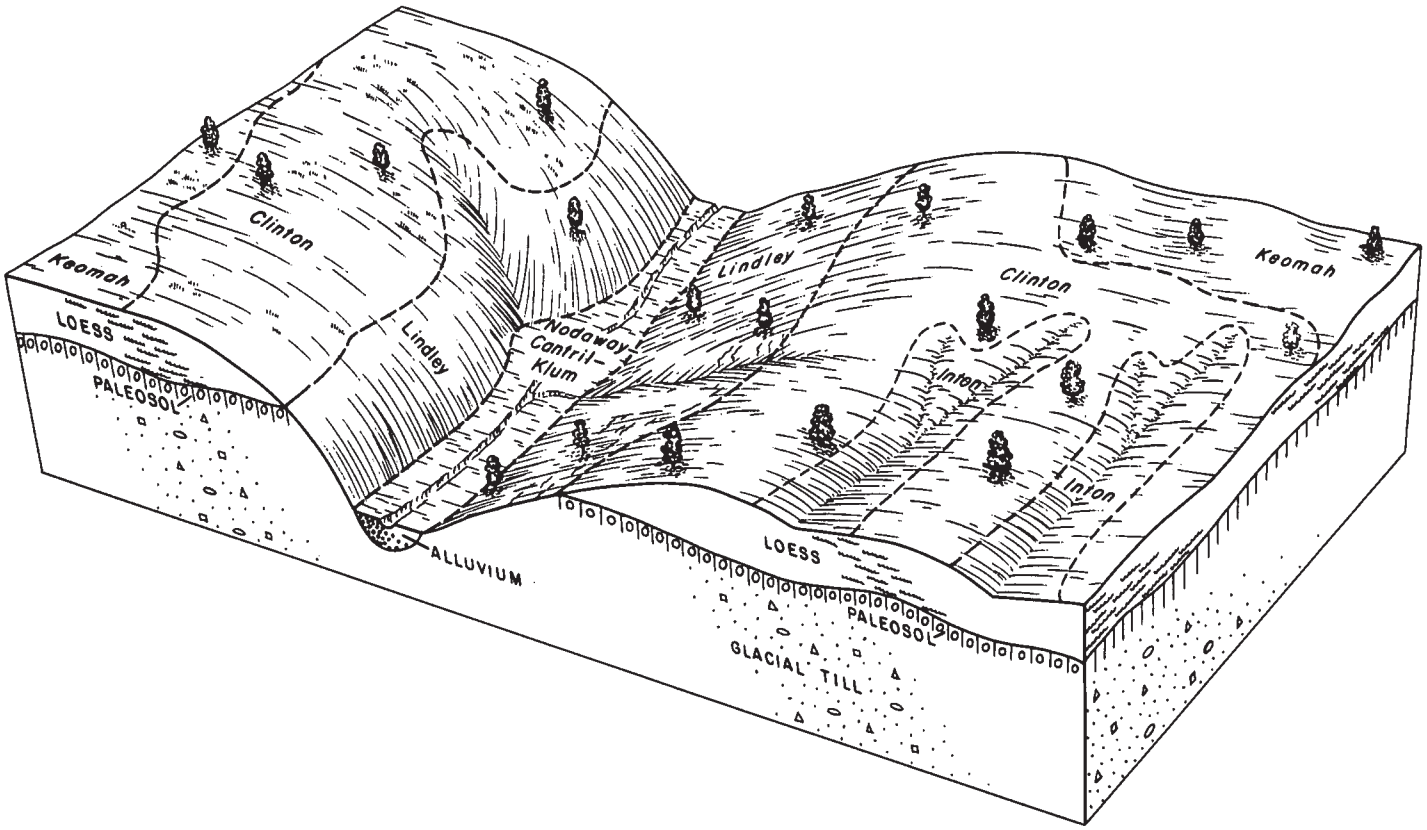


Figure 7.—Typical pattern of soils and parent materials in the Clinton-Lindley association.

Figure 8.—An area of Clinton soils in the Clinton-Lindley association. Keomah soils are on the right.

lower part is grayish brown and olive gray. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam.

Typically, the surface layer of the Hedrick soils is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is mottled, friable silty clay loam about 33 inches thick. The upper part is brown, and the lower part is grayish brown. The substratum to a depth of about 60 inches is grayish brown, mottled silty clay loam.

Typically, the surface layer of the Ladoga soils is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is mottled, friable and firm silty clay loam about 36 inches thick. The upper part is dark yellowish brown, and the lower part is grayish brown, brown, and yellowish brown. The substratum to a depth of about 60 inches is dark yellowish brown, mottled silty clay loam.

Minor in this association are the moderately well drained Otley and Nira soils on the upper side slopes; the moderately well drained Gara soils on the lower side slopes; the somewhat poorly drained or poorly drained Rinda soils in coves at the head of drainageways and on the lower side slopes; the poorly drained Colo soils in drainageways; and the somewhat poorly drained Mahaska soils on upland divides.

Most of this association is used for cultivated crops. The more sloping areas are used as permanent pasture.

The soils in this association are well suited or moderately suited to all of the cultivated crops commonly grown in the county. The chief enterprises are growing corn and soybeans for cash and feeding beef cattle. The main management needs are measures that control erosion and maintain tilth and fertility.

7. Weller-Pershing-Grundy association

Gently sloping and moderately sloping, moderately well drained and somewhat poorly drained, silty soils on uplands

This association is on narrow ridgetops and convex side slopes characterized by a well developed network of drainageways. The trees on this association generally are in groves or windbreaks near the farmsteads or are along drainageways in the more sloping areas. The soils formed in loess. Slopes range from 1 to 9 percent.

This association makes up about 3 percent of the county. It is about 32 percent Weller soils, 19 percent Pershing soils, 11 percent Grundy soils, and 38 percent minor soils (fig. 11).

Weller and Pershing soils are gently sloping and moderately sloping. They are on ridgetops and side slopes. Weller soils are moderately well drained and Pershing soils moderately well drained or somewhat poorly drained. Grundy soils are somewhat poorly drained and are gently sloping. They are on ridgetops.

Typically, the surface layer of the Weller soils is brown silt loam about 5 inches thick. The subsurface layer is brown, mottled silt loam about 4 inches thick. The upper part of the subsoil is yellowish brown, mottled, firm silty clay loam and silty clay. The lower part to a depth of about 60 inches is yellowish brown, grayish brown,

Figure 9.—An abandoned farmstead on Clinton soils in the Clinton-Lindley association. Lindley soils are on the left.

brown, and dark grayish brown, mottled, firm silty clay loam.

Typically, the surface layer of the Pershing soils is very dark grayish brown silt loam about 9 inches thick. The upper part of the subsoil is brown, mottled, friable silty clay loam, and the next part is dark grayish brown, mottled, firm silty clay and silty clay loam. The lower part to a depth of about 60 inches is grayish brown, mottled, firm and friable silty clay loam.

Typically, the surface layer of the Grundy soils is black silty clay loam about 10 inches thick. The subsurface layer is very dark gray silty clay loam about 4 inches thick. The subsoil is about 42 inches thick. It is dark grayish brown, mottled, friable silty clay loam in the upper part; dark grayish brown and grayish brown, mottled, firm silty clay and silty clay loam in the next part; and olive gray, mottled, friable silty clay loam in the lower part. The substratum to a depth of about 60 inches is olive gray, mottled, friable silty clay loam.

Minor in this association are the poorly drained Belinda and Haig soils on upland divides; the somewhat poorly drained or poorly drained Ashgrove and Rinda and moderately well drained Keswick soils in coves at the head of drainageways; the well drained Lindley soils on the lower side slopes; and the moderately well drained Klum and Nodaway and somewhat poorly drained Cantril soils in drainageways.

Most of this association is used for cultivated crops. The more sloping areas are used as permanent pasture.

Weller and Pershing soils are moderately suited to poorly suited and Grundy soils well suited to all of the cultivated crops commonly grown in the county. The main enterprises are growing corn and soybeans for cash and feeding beef cattle and swine. The main management needs are measures that control wetness and erosion and maintain tilth and fertility.

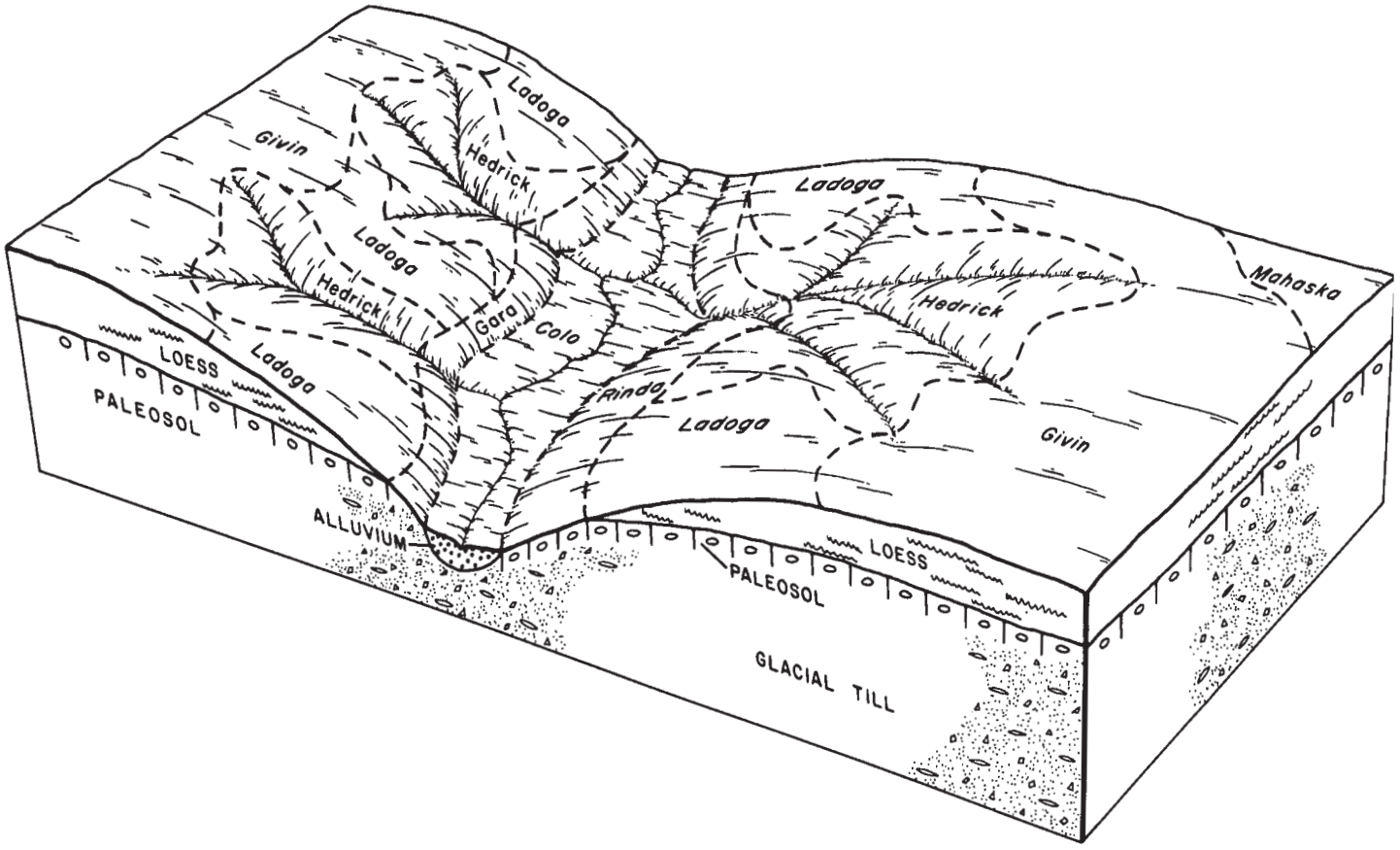


Figure 10.—Typical pattern of soils and parent materials in the Givin-Hedrick-Ladoga association.

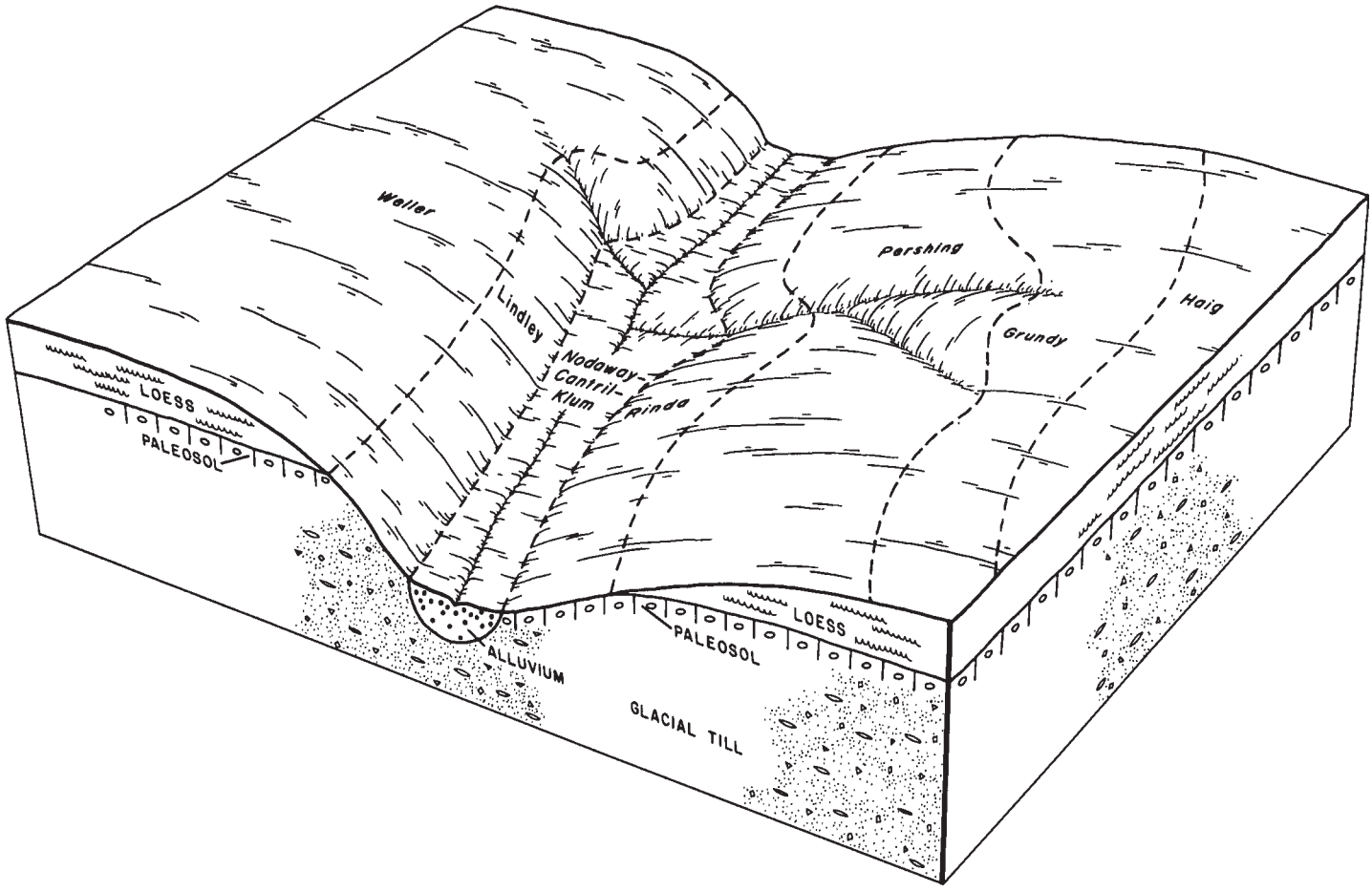


Figure 11.—Typical pattern of soils and parent materials in the Weller-Pershing-Grundy association.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and identifies the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Clinton silt loam, 2 to 5 percent slopes, is one of several phases in the Clinton series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils that occur as areas so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Gara-Rinda complex, 9 to 14 percent slopes, moderately eroded, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. These dissimiliar soils are described in each map unit. Also, some of the more unusual or strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes some *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, limestone quarry, is an example. Some miscellaneous areas are large enough to be delineated on the soil maps. Some that are too small to be delineated are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

41—Sparta loamy fine sand, 0 to 2 percent slopes. This nearly level, excessively drained soil is on stream benches. Areas are irregular in shape and mainly are 5 to 30 acres in size.

Typically, the surface layer is black loamy fine sand about 8 inches thick. The subsurface layer is about 14 inches of very dark brown and very dark grayish brown loamy fine sand and sand. The subsoil is about 36 inches thick. It is brown, very friable sand in the upper part; dark yellowish brown and yellowish brown, very friable sand in the next part; and brown, very friable loamy fine sand in the lower part. The substratum to a depth of about 60 inches is brown, very friable loamy fine sand.

Included with this soil in mapping are scattered small areas of Dickinson soils. These soils make up about 5 to 10 percent of the unit. They contain more clay and less sand in the surface layer, subsurface layer, and subsoil than the Sparta soil and are not so droughty.

Permeability is rapid in the Sparta soil. Available water capacity is low. Surface runoff is slow. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The subsoil is slightly acid or medium acid. It has a very low supply of available phosphorus and potassium.

Most areas are cultivated. Some are used for pasture and hay. This soil is poorly suited to corn, soybeans, and small grain because it is droughty and is subject to soil blowing. A conservation tillage system that leaves crop residue on the surface conserves moisture and helps to control soil blowing. Returning crop residue to the soil or

regularly adding other organic material improves fertility and helps to control soil blowing.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling soil blowing. Proper stocking rates, pasture rotation, and timely deferment of grazing during dry periods help to keep the pasture or hayland in good condition.

This soil is well suited to trees. It supports trees in groves and around farmsteads, but few areas are extensively wooded. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. The hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IVs.

41B—Sparta loamy fine sand, 2 to 7 percent slopes. This gently sloping, excessively drained soil is on stream benches. Areas are irregular in shape and mainly are 5 to 40 acres in size.

Typically, the surface layer is very dark brown loamy fine sand about 8 inches thick. The subsurface layer is about 14 inches of very dark brown and very dark grayish brown loamy fine sand and sand. The subsoil is about 36 inches thick. It is brown, very friable sand in the upper part; dark yellowish brown and yellowish brown, very friable sand in the next part; and brown, very friable loamy fine sand in the lower part. The substratum to a depth of about 60 inches is brown loamy fine sand.

Included with this soil in mapping are small areas adjacent to bottom land where the slope is more than 7 percent. These areas make up about 5 to 10 percent of the unit.

Permeability is rapid in the Sparta soil. Available water capacity is low. Surface runoff is slow. Tilth generally is good. The content of organic matter is about 1.0 to 2.0 percent in the surface layer. The subsoil is slightly acid or medium acid. It has a very low supply of available phosphorus and potassium.

Most areas are cultivated. Some are used for pasture and hay. This soil is poorly suited to corn, soybeans, and small grain because it is droughty and is subject to soil blowing and erosion. A conservation tillage system that leaves crop residue on the surface conserves moisture and helps to control soil blowing and erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to control erosion and prevent deterioration of tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing during dry periods help to keep the pasture in good condition.

This soil is well suited to trees. It supports trees in groves and around farmsteads, but few areas are extensively wooded. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. The hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IVs.

51—Vesser silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained or poorly drained soil is in the higher areas on bottom land and on foot slopes and alluvial fans. It is subject to flooding, but many areas are protected. Areas are irregular in shape and mainly are 5 to 30 acres in size.

Typically, the surface layer is very dark brown silt loam about 7 inches thick. Plowing has mixed some of the dark grayish brown subsurface layer with the surface layer. The subsurface layer is mottled silt loam about 18 inches thick. The upper part is very dark brown, and the lower part is dark grayish brown. The upper part of the subsoil is dark grayish brown, mottled, friable silty clay loam. The lower part to a depth of about 60 inches is mottled yellowish brown and dark grayish brown, friable silty clay loam.

Included with this soil in mapping are areas of the poorly drained Tuskeego soils. These soils make up about 5 to 10 percent of the unit. They cannot be drained so easily as the Vesser soil.

The Vesser soil is moderately permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is good. The content of organic matter is about 2.0 to 3.0 percent. The subsoil is medium acid. It has a medium supply of available phosphorus and a low supply of available potassium.

Most areas are used for row crops. Some are used for hay and pasture. This soil is moderately suited to corn, soybeans, and small grain. If the soil is adequately drained and protected from flooding, row crops can be grown in most years. Tile drains function satisfactorily if suitable outlets are available. In many places diversion terraces on adjacent foot slopes help to control the runoff from the higher areas.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet, however, causes surface compaction and deterioration of tilth.

The capability subclass is IIw.

54—Zook silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is in the lower areas on bottom land, generally adjacent to foot slopes and terrace escarpments. It is subject to flooding, but most areas are protected. Areas are elongated or are irregular in shape and mainly are 20 to 100 acres in size.

Typically, the surface layer is black silty clay loam about 5 inches thick. The subsurface layer is about 33 inches thick. It is black, mottled silty clay loam in the upper part and black, mottled silty clay in the lower part.

The upper part of the subsoil is mottled gray and olive gray, firm silty clay loam. The next part is dark gray, mottled, firm silty clay loam. The lower part to a depth of about 60 inches is gray and olive gray, mottled, friable silty clay loam.

This soil is slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is fair or poor. The content of organic matter is 4.0 to 6.0 percent in the surface layer. The shrink-swell potential is high. The subsoil is neutral. It has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, a subsurface drainage system is needed to reduce the wetness and provide aeration and a deep root zone for plants. Tile drains generally work satisfactorily only if they are closely spaced. In some areas open ditches are needed. Even though many areas are protected by levees and dikes, flooding still occurs if the structures are breached by floodwater. Returning crop residue to the soil and deferring tillage when the soil is wet help to prevent deterioration of tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth.

The capability subclass is IIw.

56B—Cantril loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on foot slopes, alluvial fans, and stream terraces. Areas generally are elongated and range from 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. The subsurface layer is dark grayish brown, mottled loam about 5 inches thick. The subsoil is about 44 inches thick. It is grayish brown and brown, mottled, and friable. It is loam in the upper part and clay loam in the lower part. The substratum to a depth of about 60 inches is mottled dark grayish brown and yellowish brown loam. In some places the surface layer is thicker or darker colored. In other places it is lighter colored.

Included with this soil in mapping are areas of the somewhat poorly drained or poorly drained Coppock soils on the lower slopes. These soils contain less sand throughout than the Cantril soil. They make up about 5 to 10 percent of the unit.

The Cantril soil is moderately permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 1.5 to 2.5 percent in the surface layer. The subsoil is strongly acid. It typically has a low supply of available phosphorus and potassium.

Most areas are used for timber or pasture. Some are used for cultivated crops. This soil is moderately suited to corn, soybeans, and small grain. It receives runoff from adjacent slopes. A diversion terrace helps to control the runoff. Many areas are too small to be cropped separately. If cultivated crops are grown, erosion is a slight hazard. A conservation tillage system that leaves crop residue on the surface, terraces, and contour farming help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of hay or pasture plants helps to control erosion. The siltation caused by the runoff from adjacent soils occasionally damages the plant cover. Because of the seasonal high water table, restricted grazing is needed to prevent surface compaction and damage to the plant cover.

This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIe.

58E—Douds loam, 14 to 18 percent slopes. This moderately steep, moderately well drained soil is on ridgetops and side slopes on high upland benches that border the valleys of the major streams and their tributaries. Areas are irregular in shape and mainly are 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown loam about 3 inches thick. The subsurface layer is brown, mottled loam about 5 inches thick. The upper part of the subsoil is dark yellowish brown and brown, mottled, friable loam. The lower part to a depth of about 60 inches is dark grayish brown and brown, mottled, friable sandy clay loam. In places the slope is less than 14 percent.

This soil is moderately permeable. It has a seasonal high water table. Available water capacity is moderate or high. Surface runoff is rapid. Tilth generally is good. The content of organic matter is 0.5 to 1.0 percent in the surface layer. The subsoil generally is strongly acid or medium acid. It has a very low supply of available phosphorus and potassium.

Most areas are used for hay, pasture, or woodland. Because of a severe hazard of erosion, this soil is not suited to cultivated crops. It is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is moderately suited to trees. Erosion and the equipment limitation are the main management concerns. When new stands are established, cover crops help to control erosion, but they should be carefully managed so that the resulting plant competition is not excessive. Because of the moderately steep slope,

operating some machinery is difficult or hazardous and hand planting is needed in some areas.

The capability subclass is VIe.

65D2—Lindley loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, well drained soil is on convex side slopes in the uplands. Areas are irregular in shape and mainly are 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. Plowing has mixed some of the yellowish brown loam subsoil with the surface layer. The upper part of the subsoil is yellowish brown, friable loam. The lower part to a depth of about 60 inches is yellowish brown, mottled, firm clay loam. In some areas the surface layer is brown clay loam. In some potentially seepy areas, the subsoil is reddish brown or yellowish red and contains more clay.

Included with this soil in mapping are small areas of Ashgrove soils, which occur as narrow bands on the upper side slopes. These soils make up 2 to 4 percent of the unit. They are seepy during wet periods. Their subsoil contains more clay than that of the Lindley soil.

Permeability is moderately slow in the Lindley soil. Available water capacity is high. Surface runoff is rapid. Tilth typically is good. The content of organic matter is less than 0.5 percent in the surface layer. The subsoil generally is medium acid or strongly acid. It has a medium supply of available phosphorus and a very low supply of available potassium.

Many areas are cultivated. Some are used for hay or pasture. This soil is poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, further erosion is a severe hazard. A conservation tillage system that leaves crop residue on the surface and contour farming help to prevent further erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is moderately suited to trees. In open areas where the soil has been cultivated or is moderately eroded, conifers are better suited than hardwoods. The hardwoods generally require a better site and grow more satisfactorily if planted in uncultivated areas. Tree seeds, cuttings, and seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IVe.

65E—Lindley loam, 14 to 18 percent slopes. This moderately steep, well drained soil is on the narrow tops and sides of ridges in the uplands. Areas are irregular in shape and mainly are 10 to 200 acres in size.

Typically, the surface layer is very dark grayish brown loam about 3 inches thick. The subsurface layer is brown loam about 4 inches thick. The upper part of the subsoil is yellowish brown, friable loam. The next part is yellowish brown, mottled, firm clay loam. The lower part to a depth of about 60 inches is yellowish brown and strong brown, mottled, firm clay loam. In some areas the subsoil is reddish brown or yellowish red and contains more clay. These areas may be seepy.

Included with this soil in mapping are some small areas of Ashgrove soils, which occur as narrow bands on the upper side slopes. These soils make up 1 to 3 percent of the unit. They are seepy during wet periods. Their subsoil contains more clay than that of the Lindley soil.

Permeability is moderately slow in the Lindley soil. Available water capacity is high. Surface runoff is rapid. Tilth generally is good. The content of organic matter is 1.0 to 1.5 percent in the surface layer. The subsoil generally is medium acid or strongly acid. It has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used for pasture, hay, or timber. Because of a severe hazard of erosion, this soil is generally unsuitable for cultivated crops. It is moderately suited to grasses and legumes for hay and pasture. A cover of these plants is effective in controlling erosion. Pasture renovation or reseeding is needed in some of the steeper areas. Preparing a seedbed, however, is difficult. Because of the slope, operating farm machinery is difficult and dangerous. Caution is needed in operating the machinery. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and deterioration of tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Erosion and the equipment limitation are the main management concerns. When new stands are established, cover crops help to control erosion, but they should be carefully managed so that the resulting plant competition is not excessive. Because of the moderately steep slope, operating some machinery is difficult or hazardous and hand planting is needed.

The capability subclass is VIe.

65E2—Lindley loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is on the narrow tops of ridges and on nose slopes and side slopes in the uplands. Areas are irregular in shape and mainly are 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown loam about 7 inches thick. Plowing has mixed some of the dark yellowish brown loam subsoil with the surface layer. The subsoil is about 51 inches thick. The upper part is dark yellowish brown, friable loam, and the lower part is

yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In some areas the surface layer is brown clay loam. In some potentially seepy areas, the subsoil is reddish brown or yellowish red and contains more clay.

Included with this soil in mapping are small areas of Ashgrove soils, which occur as narrow bands on the upper side slopes. These soils make up 1 to 3 percent of the unit. They are seepy during wet periods. Their subsoil contains more clay than that of the Lindley soil.

Permeability is moderately slow in the Lindley soil. Available water capacity is high. Surface runoff is rapid. Tilth generally is fair. The content of organic matter is less than 0.5 percent in the surface layer. The subsoil generally is medium acid or strongly acid. It has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used for pasture and hay but have been cultivated at some time in the past. Because of a severe hazard of erosion, this soil is generally unsuitable for cultivated crops. It is moderately suited to grasses and legumes for hay and pasture. A cover of these plants is effective in controlling erosion. Reseeding or pasture renovation is needed in some of the steeper areas. Preparing a seedbed, however, is difficult. Because of the slope, operating farm machinery is difficult and dangerous. Caution is needed in operating the machinery. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and deterioration of tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

A few areas support native hardwoods. This soil is moderately suited to trees. Erosion, the equipment limitation, and seedling mortality are the main management concerns. Carefully selecting sites for logging trails or roads and laying out the trails or roads on the contour help to control erosion. Because of the slope, special logging equipment is needed. Also, caution is needed in operating this equipment. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees.

The capability subclass is VIe.

65F—Lindley loam, 18 to 25 percent slopes. This steep, well drained soil is on the narrow tops of ridges and on nose slopes and side slopes in the uplands. Areas are irregular in shape and mainly are 5 to 100 or more acres in size.

Typically, the surface layer is very dark brown loam about 3 inches thick. The subsurface layer is grayish brown loam about 3 inches thick. The subsoil is about 49 inches thick. The upper part is yellowish brown, firm clay loam, and the lower part is yellowish brown and strong brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is strong brown, mottled clay loam. In some eroded areas the subsoil is exposed.

Included with this soil in mapping are areas of gray silty clay, which occur as short bands generally about halfway down the side slopes. These areas make up 1 to 3 percent of the unit. They are seepy following some periods of heavy rainfall and are subject to slipping and sliding. Also included are small areas where limestone crops out. These areas generally are near the lower slopes. They make up less than 5 percent of the unit.

Permeability is moderately slow in the Lindley soil. Available water capacity is high. Surface runoff is rapid. Tilth generally is good. The content of organic matter is 0.5 to 1.0 percent in the surface layer. The subsoil generally is medium acid or strongly acid. It has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used for pasture, woodland, or wildlife habitat. Because of a severe hazard of erosion, this soil is unsuitable for cultivated crops. It is poorly suited to grasses and legumes for pasture. If pasture plants can be established, however, the plant cover is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and deterioration of tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition. Operating ordinary farm machinery is difficult and dangerous because of the steep slope.

This soil is well suited to upland oaks and conifers. The trees grow best on the north and east sides of the lower slopes and in coves. Tree seeds, cuttings, and seedlings survive and grow well. Erosion and the equipment limitation are the main management concerns. Because of the steep slope, operating equipment is difficult and hazardous. When new stands are established, cover crops help to control erosion, but they should be carefully managed so that the resulting plant competition is not excessive.

The capability subclass is VIIe.

65G—Lindley loam, 25 to 40 percent slopes. This very steep, well drained soil is on convex side slopes in the uplands. Areas are irregular in shape and mainly are 20 to 100 acres in size.

Typically, the surface layer is dark gray loam about 2 inches thick. The subsurface layer is dark grayish brown loam about 3 inches thick. The subsoil is about 47 inches thick. The upper part is yellowish brown, mottled, firm clay loam, and the lower part is strong brown, mottled clay loam. The substratum to a depth of about 60 inches is strong brown clay loam. In some areas the slope is as much as 60 percent.

Included with this soil in mapping are areas of gray silty clay or clay, which occur as short bands generally about halfway down the side slopes. These areas make up 2 to 5 percent of the unit. They are seepy following

some periods of heavy rainfall and are subject to slipping or sliding. Also included are small areas where limestone crops out. These areas generally are near the lower slopes. They make up less than 5 percent of the unit.

Permeability is moderately slow in the Lindley soil. Available water capacity is high. Surface runoff is very rapid. Tilth generally is good. The content of organic matter is less than 0.5 percent in the surface layer. The subsoil generally is medium acid or strongly acid. It has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used for woodland, pasture, or wildlife habitat. Because of a severe hazard of erosion, this soil is unsuitable for cultivated crops. It is poorly suited to grasses and legumes for pasture because of the very steep slope. If pasture plants can be established, however, the plant cover is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and deterioration of tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition. Operating ordinary farm machinery is difficult and dangerous because of the very steep slope.

This soil is moderately suited to upland oaks and conifers. The trees grow best on the north and east sides of the lower slopes and in coves. Erosion and the equipment limitation are the main management concerns. When new stands are established, cover crops help to control erosion, but they should be carefully managed so that the resulting plant competition is not excessive. Because operating equipment on the very steep slopes is difficult and dangerous, much of the work should be done by hand.

The capability subclass is VIIe.

74—Rubio silt loam, 0 to 2 percent slopes. This depressional or nearly level, poorly drained or very poorly drained soil is on the tops of ridges in the uplands. Areas are irregular in shape and generally range from 5 to 40 acres in size.

Typically, the surface layer is very dark gray silt loam about 8 inches thick. The subsurface layer is dark gray and gray, mottled silt loam about 10 inches thick. The subsoil is about 37 inches thick. It is dark gray and olive gray, mottled, friable and firm silty clay loam in the upper part; olive gray, mottled, firm silty clay in the next part; and olive gray and gray, mottled, firm silty clay loam in the lower part. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam. In some areas the surface layer is lighter in color and contains less organic matter.

Included with this soil in mapping are areas of the somewhat poorly drained Givin soils on slight rises. These soils make up 5 to 10 percent of the unit.

The Rubio soil is slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is good. The content of organic matter is 2.0 to 3.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is strongly acid to slightly acid. It generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for row crops. This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, a subsurface drainage system is needed to reduce the wetness and provide aeration and a deep root zone for plants. Tile drains generally function satisfactorily if suitable outlets are available. In some areas a surface drainage system is needed. Returning crop residue to the soil and deferring fieldwork when the soil is wet help to prevent deterioration of tilth and improve fertility.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

A few areas support native hardwoods. This soil is poorly suited to trees because of the wetness. The main concerns of management are the equipment limitation, the windthrow hazard, and seedling mortality. Logging equipment should be used only during the drier periods or during the winter, when the ground is frozen. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow.

The capability subclass is IIIw.

75—Givin silt loam, 1 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on the tops of ridges in the uplands. Areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is very dark brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown, mottled silt loam about 4 inches thick. The subsoil is mottled, friable and firm silty clay loam about 36 inches thick. It is dark grayish brown, grayish brown and brown in the upper part and grayish brown and olive gray in the lower part. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam.

Included with this soil in mapping are small areas of the poorly drained or very poorly drained Rubio soils. These soils make up about 5 to 10 percent of the unit.

The Givin soil is moderately slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is good. The content of organic matter is 2.0 to 3.0 percent in the surface layer. The subsoil is strongly acid or medium

acid. It has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops. Some are used for hay and pasture. This soil is well suited to corn, soybeans, and small grain. Most areas are adequately drained. In some areas, however, tile drains are needed to improve the timeliness of fieldwork in wet years. They function satisfactorily if suitable outlets are available. If cultivated, some areas are subject to erosion. Returning crop residue to the soil and delaying fieldwork when the soil is wet help to prevent deterioration of tilth and improve fertility.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet, however, causes some surface compaction and a deterioration of tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability class is I.

76B—Ladoga silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on the tops and sides of ridges in the uplands. Areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is mottled, friable and firm silty clay loam about 36 inches thick. The upper part is dark yellowish brown, and the lower part is grayish brown, brown, and yellowish brown. The substratum to a depth of about 60 inches is dark yellowish brown, mottled silty clay loam.

Included with this soil in mapping are areas of the nearly level, somewhat poorly drained Givin soils. These soils make up about 5 to 10 percent of the unit.

Permeability is moderate in the Ladoga soil. Available water capacity is high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 2.0 to 3.0 percent in the surface layer. The subsoil is medium acid or strongly acid. It has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops or hay and pasture. This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of short, irregular slopes. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

A few areas support native hardwoods. This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIe.

76C—Ladoga silt loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is on the narrow tops and sides of ridges in the uplands. Areas are irregular in shape and mainly are 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is mottled, friable silty clay loam about 36 inches thick. The upper part is dark yellowish brown, and the lower part is grayish brown and yellowish brown. The substratum to a depth of about 60 inches is dark yellowish brown, mottled silty clay loam. In places the upper part of the subsoil is grayer.

Permeability is moderate. Available water capacity is high. Surface runoff is medium. Tilth generally is good unless the soil is tilled when wet. The content of organic matter is 1.5 to 2.5 percent in the surface layer. The subsoil is medium acid or strongly acid. It has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops or hay and pasture. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of short, irregular slopes. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Pasture renovation is needed in many areas. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

A few areas support native hardwoods. This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

76C2—Ladoga silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on the narrow tops and

sides of ridges in the uplands. Areas are irregular in shape and mainly are 5 to 40 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. Plowing has mixed some of the dark yellowish brown silty clay loam subsoil with the surface layer. The subsoil is mottled, firm silty clay loam about 34 inches thick. The upper part is dark yellowish brown, and the lower part is grayish brown and yellowish brown. The substratum to a depth of about 60 inches is dark yellowish brown, mottled silty clay loam. In places the upper part of the subsoil is grayer.

Permeability is moderate. Available water capacity is high. Surface runoff is medium. Tilth generally is fair. The content of organic matter is 0.5 to 1.5 percent in the surface layer. The subsoil is medium acid or strongly acid. It has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops. Some are used for hay and pasture. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, further erosion is a hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of short, irregular slopes. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Pasture renovation is needed in some areas. Proper stocking rates, pasture rotation, and timely deferment of grazing during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

80B—Clinton silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on the tops and sides of ridges in the uplands. Areas are irregular in shape and mainly are 5 to 40 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is dark yellowish brown, mottled, friable and firm silty clay loam about 34 inches thick. The substratum to a depth of about 60 inches is multicolored silty clay loam.

Included with this soil in mapping are areas of the nearly level, somewhat poorly drained Keomah soils. These soils make up about 5 to 10 percent of the unit.

Permeability is moderately slow in the Clinton soil. Available water capacity is high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 1.5 to 2.5 percent in the the surface layer. The subsoil is strongly acid or medium acid. It has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops or hay and pasture. Some are wooded. This soil is well suited to corn, soybeans, and small grain. If row crops are grown, erosion is a moderate hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of short, irregular slopes. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

A few areas remain in native hardwoods. This soil is well suited to trees. The hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIe.

80C—Clinton silt loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is on the tops and sides of ridges in the uplands. Areas are irregular in shape and mainly are 5 to 100 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 5 inches thick. The subsurface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is mottled, firm and friable silty clay loam about 35 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is grayish brown and brown, mottled silty clay loam. In places the subsoil is grayish brown or light brownish gray and contains less clay.

Included with this soil in mapping are areas of Inton soils at the head of drainageways. These soils make up about 5 to 10 percent of the unit. Their subsoil is grayer than that of the Clinton soil.

Permeability is moderately slow in the Clinton soil. Available water capacity is high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The subsoil is strongly acid or medium acid. It has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are used for pasture or woodland. Some are used for crops. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of short, irregular slopes. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. The hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

80C2—Clinton silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on the narrow tops and sides of ridges in the uplands. Areas are irregular in shape and mainly are 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. Plowing has mixed some of the dark yellowish brown silty clay loam subsoil with the surface layer. The subsoil is mottled, firm silty clay loam about 34 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is grayish brown and brown, mottled silty clay loam. In places the subsoil is grayer and contains less clay.

Permeability is moderately slow. Available water capacity is high. Surface runoff is medium. Tilth generally is fair. The content of organic matter is 0.5 to 1.0 percent in the surface layer. The subsoil is strongly acid or medium acid. It has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops or hay and pasture. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, further erosion is a hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of short, irregular slopes.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

Very few areas remain in native hardwoods. This soil is well suited to trees. The hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

80D—Clinton silt loam, 9 to 14 percent slopes. This strongly sloping, moderately well drained soil is on convex side slopes in the uplands. Areas are irregular in shape and mainly are 5 to 15 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is dark grayish brown silt loam about 5 inches thick. The subsoil is about 33 inches thick. It is yellowish brown, mottled, friable silty clay loam in the upper part and dark yellowish brown and yellowish brown, mottled, firm silty clay loam in the lower part. The substratum to a depth of about 60 inches is dark yellowish brown, mottled silty clay loam. In places dark brown clay loam is at a depth of about 55 inches or more.

Included with this soil in mapping are areas of the poorly drained or somewhat poorly drained Ashgrove soils on the lower slopes near the head of drainageways. These soils make up 5 to 10 percent of the unit. Their subsoil is gray clay.

Permeability is moderately slow in the Clinton soil. Available water capacity is high. Surface runoff is rapid. Tilth generally is good. The content of organic matter is 0.5 to 1.0 percent in the surface layer. The subsoil is strongly acid or medium acid. It has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are used for pasture or woodland. Some are used for cultivated crops. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a severe hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of short, irregular slopes. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Pasture renovation is needed in many areas. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. The hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

80D2—Clinton silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained soil is on the convex upper side slopes in the uplands. Areas are irregular in shape and mainly are 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. Plowing has mixed some of the dark yellowish brown silty clay loam subsoil with the surface layer. The subsoil is mottled, firm silty clay loam about 34 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown. The substratum to a depth of about 60 inches is yellowish brown, mottled silty clay loam.

Included with this soil in mapping are small areas of the poorly drained or somewhat poorly drained Ashgrove soils on the lower slopes near the head of small

drainageways. These soils make up about 5 to 10 percent of the unit. Their subsoil is gray clay.

Permeability is moderately slow in the Clinton soil. Available water capacity is high. Surface runoff is rapid. Tilth generally is fair. The content of organic matter is less than 0.5 percent in the surface layer. The subsoil is strongly acid or medium acid. It has a high supply of available phosphorus and a very low supply of available potassium.

Many areas are used for cultivated crops. Some are used for hay and pasture. Nearly all were cultivated at some time in the past. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, further erosion is a severe hazard. A conservation tillage system that leaves crop residue on the surface, terraces, and contour farming help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of short, irregular slopes. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

Very few areas remain in native hardwoods. This soil is well suited to trees. The hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

122—Sperry silt loam, 0 to 1 percent slopes. This nearly level, very poorly drained or poorly drained soil is in slight depressions on broad upland divides. Areas are irregular in shape and commonly range from 3 to 10 or more acres in size.

Typically, the surface layer is black silt loam about 6 inches thick. Plowing has mixed some of the dark gray subsurface layer with the surface layer. The subsurface layer is black and dark gray, mottled silt loam about 8 inches thick. The upper part of the subsoil is very dark gray, mottled, friable silty clay loam. The next part is dark gray, mottled, firm silty clay. The lower part to a depth of about 60 inches is dark grayish brown and olive gray, mottled, firm and friable silty clay loam.

Included with this soil in mapping are small areas of Taintor soils on the higher parts of the landscape between depressions that are subject to ponding. These soils make up 5 to 10 percent of the unit. They contain more clay in the surface layer and less clay in the subsoil than the Sperry soil.

The Sperry soil is slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow or in some areas ponded. The content of organic matter is 3.0 to 4.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is medium acid or slightly acid. It has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, a subsurface drainage system is needed to reduce the wetness and provide aeration and a deep root zone for plants. Tile drains generally do not function satisfactorily because the soil is slowly permeable. In most areas a surface drainage system is needed. Returning crop residue to the soil and deferring fieldwork when the soil is wet improve fertility and help to prevent deterioration of tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet causes surface compaction and deterioration of tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

The capability subclass is IIIw.

130—Belinda silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on the tops of ridges in the uplands. Areas are irregular in shape and commonly range from 5 to 30 or more acres in size.

Typically, the surface layer is very dark gray silt loam about 8 inches thick. Plowing has mixed some of the dark grayish brown subsurface layer with the surface layer. The subsurface layer is dark grayish brown and grayish brown, mottled silt loam about 10 inches thick. The upper part of the subsoil is dark grayish brown, mottled, firm silty clay. The next part is grayish brown, mottled, firm and friable silty clay loam. The lower part to a depth of about 60 inches is light brownish gray, mottled, friable silty clay loam. In some small areas the surface layer is very dark brown and is about 10 to 12 inches thick.

Included with this soil in mapping are small areas of the moderately well drained or somewhat poorly drained Pershing soils on the more sloping parts of the landscape. These soils make up 5 to 10 percent of the unit.

The Belinda soil is slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is very slow. Tilth generally is fair. The content of organic matter is 2.0 to 3.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is strongly acid or medium acid. It has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for row crops. Some are used for pasture or timber. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, a subsurface drainage system is needed to reduce the wetness and provide aeration and a deep root zone for plants. Tile drains generally do not function satisfactorily because the soil is very slowly permeable. In most areas a surface drainage system is needed. Returning crop

residue to the soil and deferring fieldwork when the soil is wet improve tilth and fertility.

This soil is moderately suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

A few areas support native hardwoods. This soil is poorly suited to trees. The main concerns of management are the equipment limitation, the windthrow hazard, and seedling mortality. Logging equipment should be used only during the drier periods or during the winter, when the ground is frozen. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow.

The capability subclass is IIIw.

131B—Pershing silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained or somewhat poorly drained soil is on the tops of ridges and on convex side slopes bordering nearly level, stable interstream divides in the uplands. Areas are elongated and irregular in shape and commonly range from 5 to 50 or more acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. Plowing has mixed some of the dark grayish brown subsurface layer with the surface layer. The upper part of the subsoil is brown, mottled, friable silty clay loam. The next part is dark grayish brown, mottled, firm silty clay loam and silty clay. The lower part to a depth of about 60 inches is grayish brown, mottled, firm and friable silty clay loam.

Included with this soil in mapping are small areas of the poorly drained Belinda soils on the less sloping parts of the landscape. These soils make up 5 to 10 percent of the unit.

The Pershing soil is slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is medium. Tilth generally is fair. The content of organic matter is 1.5 to 2.5 percent in the surface layer. The subsoil has a high shrink-swell potential. It is strongly acid to slightly acid. It has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops or hay and pasture. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. Because of the slow permeability, however, contour farming or terracing may result in wet spots. If terraces are built, cuts should not expose the clayey subsoil. Grassed waterways help to prevent gully erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing during wet periods help to keep the pasture and the soil in good condition.

Most areas have been cleared of native timber. This soil is moderately suited to trees. Seedling mortality and the windthrow hazard are the main management concerns. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow. The other hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

131C2—Pershing silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, somewhat poorly drained or moderately well drained soil is on the tops of ridges and on short, convex side slopes in the uplands. Areas are irregular in shape and mainly are 5 to 40 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. Plowing has mixed some of the brown silty clay loam subsoil with the surface layer. The upper part of the subsoil is brown, mottled, friable silty clay loam. The next part is dark grayish brown, mottled, firm silty clay. The lower part to a depth of about 60 inches is grayish brown, mottled, firm silty clay loam.

Included with this soil in mapping are small areas of the poorly drained or somewhat poorly drained Rinda soils on the lower side slopes. These soils make up 5 to 10 percent of the unit. Their subsoil is gray clay.

The Pershing soil is slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is medium. Tilth generally is fair or poor. The content of organic matter is 0.5 to 1.5 percent in the surface layer. The subsoil has a high shrink-swell potential. It is strongly acid to slightly acid. It has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops or hay and pasture. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, further erosion is a hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. Because of the slow permeability, however, contour farming or terracing may result in wet spots. If terraces are built, cuts should not expose the clayey subsoil. Grassed waterways help to prevent gully erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing during wet periods help to keep the pasture and the soil in good condition.

Most areas have been cleared of native timber. This soil is moderately suited to trees. Seedling mortality and the windthrow hazard are the main management concerns. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow. The other hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

132B—Weller silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on the tops and sides of loess-covered ridges in the uplands. Areas are elongated and irregular in shape and commonly range from 5 to 50 or more acres in size.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsurface layer is brown, mottled silt loam about 4 inches thick. The upper part of the subsoil is yellowish brown, mottled, firm silty clay loam and silty clay. The lower part to a depth of about 60 inches is yellowish brown, grayish brown, brown, and dark grayish brown, mottled, firm silty clay loam.

Included with this soil in mapping are small areas of nearly level soils. These soils make up 5 to 10 percent of the unit. They are wetter than the Weller soil. Also, their subsoil is grayer.

The Weller soil is slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is strongly acid or medium acid. It has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops, hay and pasture, or woodland. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a moderate hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of irregular or short slopes. If terraces are built, cuts should not expose the clayey subsoil. Exposing the subsoil may result in seepy terrace channels. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of hay or pasture plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and excessive runoff and thus reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

Many areas have been cleared of native timber. This soil is moderately suited to trees. Seedling mortality and the windthrow hazard are the main management concerns. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow. The other hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

132C—Weller silt loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is on the tops of ridges and on short, convex side slopes in the uplands. Areas are elongated and irregular in shape and commonly range from 10 to 50 or more acres in size.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsurface layer is brown, mottled silt loam about 2 inches thick. The upper part of the subsoil is yellowish brown, mottled, firm silty clay loam and silty clay. The lower part to a depth of about 60 inches is yellowish brown, grayish brown, brown, and dark grayish brown, mottled, firm silty clay loam.

Included with this soil in mapping are small areas of Keswick soils and the poorly drained or somewhat poorly drained Ashgrove soils. These soils are on the lower side slopes. They make up 5 to 10 percent of the unit. Their subsoil contains more clay than that of the Weller soil.

The Weller soil is slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is medium. Tilth generally is fair. The content of organic matter is less than 0.5 percent in the surface layer. The subsoil has a high shrink-swell potential. It is medium acid or strongly acid. It has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used for pasture or woodland. Some are used for crops. This soil is poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of irregular or short slopes. If terraces are built, cuts should not expose the clayey subsoil. Exposing the subsoil may result in seepy terrace channels. Grassed waterways help to prevent gully erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of hay or pasture plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and excessive runoff and thus reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

Many areas have been cleared of native timber. This soil is moderately suited to trees. Seedling mortality and the windthrow hazard are the main management concerns. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow. The other hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

132C2—Weller silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on the tops of ridges and on short, convex side slopes in the uplands. Areas are elongated and irregular in shape and mainly are 10 to 60 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. Plowing has mixed some of the yellowish brown silty clay loam subsoil with the surface layer. The upper part of the subsoil is yellowish brown, mottled, firm silty clay and silty clay loam. The next part is yellowish brown, mottled, firm silty clay loam. The lower part to a depth of about 60 inches is yellowish brown, grayish brown, and dark grayish brown, mottled silty clay loam.

Included with this soil in mapping are small areas of Keswick soils and the poorly drained or somewhat poorly drained Ashgrove soils. These soils are on the lower slopes. They make up 5 to 10 percent of the unit. Their subsoil contains more clay than that of the Weller soil.

The Weller soil is slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is medium. Tilth generally is fair or poor. The content of organic matter is less than 0.5 percent in the surface layer. The subsoil has a high shrink-swell potential. It is medium acid or strongly acid. It has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used for crops or pasture and hay. A few support trees. Many of the pastured and wooded areas have been cropped in the past. This soil is poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, further erosion is a hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of irregular or short slopes. If terraces are built, cuts should not expose the clayey subsoil. Exposing the subsoil may result in seepy terrace channels. Grassed waterways help to prevent gully erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of hay or pasture plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and excessive runoff and thus reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

Many areas have been cleared of native timber. This soil is moderately suited to trees. The main concerns of management are seedling mortality and the windthrow hazard. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow. The other hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

133—Colo silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on bottom land along the minor drainageways. It is subject to flooding. Areas are irregular in shape and mainly are 5 to 100 acres in size.

Typically, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer is black silty clay loam about 28 inches thick. The subsoil is black, mottled, firm silty clay loam about 9 inches thick. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam. In places the soil contains more sand.

This soil is moderately permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is good or fair. The content of organic matter is 4.0 to 6.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is neutral. It has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. A drainage system is needed to improve the timeliness of fieldwork. In many areas diversion terraces help to control the runoff from the adjacent soils. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet, however, causes surface compaction and deterioration of tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet

periods help to keep the pasture and the soil in good condition.

The capability subclass is IIw.

133B—Colo silty clay loam, 2 to 5 percent slopes. This gently sloping, poorly drained soil is in narrow drainageways in the uplands. It is subject to flooding. Areas are elongated and mainly are 5 to 100 acres in size.

Typically, the surface layer is black silty clay loam about 9 inches thick. The subsurface layer is black silty clay loam about 30 inches thick. The subsoil is black, mottled, friable silty clay loam about 10 inches thick. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam.

Included with this soil in mapping are areas of soils that have a thinner surface layer and a browner subsurface layer. These soils make up 5 to 10 percent of the unit. They are near the edges of the mapped areas, at the base of the adjacent slopes. They are not so wet as the Colo soil.

The Colo soil is moderately permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is good or fair. The content of organic matter is 4.0 to 6.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is neutral. It has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. A drainage system is needed to improve the timeliness of fieldwork. In places diversion terraces help to control the runoff from the adjacent soils. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet, however, causes surface compaction and deterioration of tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

The capability subclass is IIw.

135—Coland clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is in narrow to moderately wide areas on the lower parts of flood plains. It is subject to flooding, but many areas are protected. Areas are elongated or irregular in shape and mainly are 10 to 100 acres in size.

Typically, the surface layer is black clay loam about 6 inches thick. The subsurface layer is black clay loam about 29 inches thick. The subsoil is firm clay loam about 13 inches thick. It is very dark gray in the upper part and dark gray and mottled in the lower part. The substratum to a depth of about 60 inches is dark gray, mottled clay loam. In places the soil contains less sand and more clay.

This soil is moderately permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is fair or poor. The content of organic matter is 3.0 to 4.0 percent in the surface layer. The shrink-swell potential is high. The subsoil is neutral. It has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. A subsurface drainage system is needed to reduce the wetness and provide aeration and a deep root zone for plants. Tile drains generally function satisfactorily. In some areas a surface drainage system is needed (fig. 12). Even though many areas are protected, flooding still occurs if the levees are breached by floodwater. Returning crop residue to the soil and deferring tillage when the soil is wet improve tilth.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is too wet, however, causes surface compaction and poor tilth.

The capability subclass is IIw.

158—Dorchester silt loam, 0 to 2 percent slopes. This nearly level, well drained or moderately well drained soil is on bottom land along the major streams. It is subject to flooding but generally is protected. Areas are irregular in shape and mainly are 200 to 300 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The substratum to a depth of about 60 inches is stratified dark brown, brown, dark grayish brown, very dark grayish brown, grayish brown, and very dark gray, mottled silt loam and silty clay loam.

Included with this soil in mapping are scattered areas in which the surface layer and substratum are sandy loam or loamy sand. These areas make up 5 to 10 percent of the unit. They are more droughty than the Dorchester soil.

Permeability is moderate in the Dorchester soil. Available water capacity is very high. Surface runoff is slow. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The substratum is mildly alkaline. It has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for row crops and hay. This soil is well suited to corn, soybeans, and small grain. If the soil is protected from flooding, row crops can be grown in most years. Nearly all areas are protected. Returning crop residue to the soil and deferring fieldwork when the soil is wet help to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet, however, causes surface compaction and deterioration

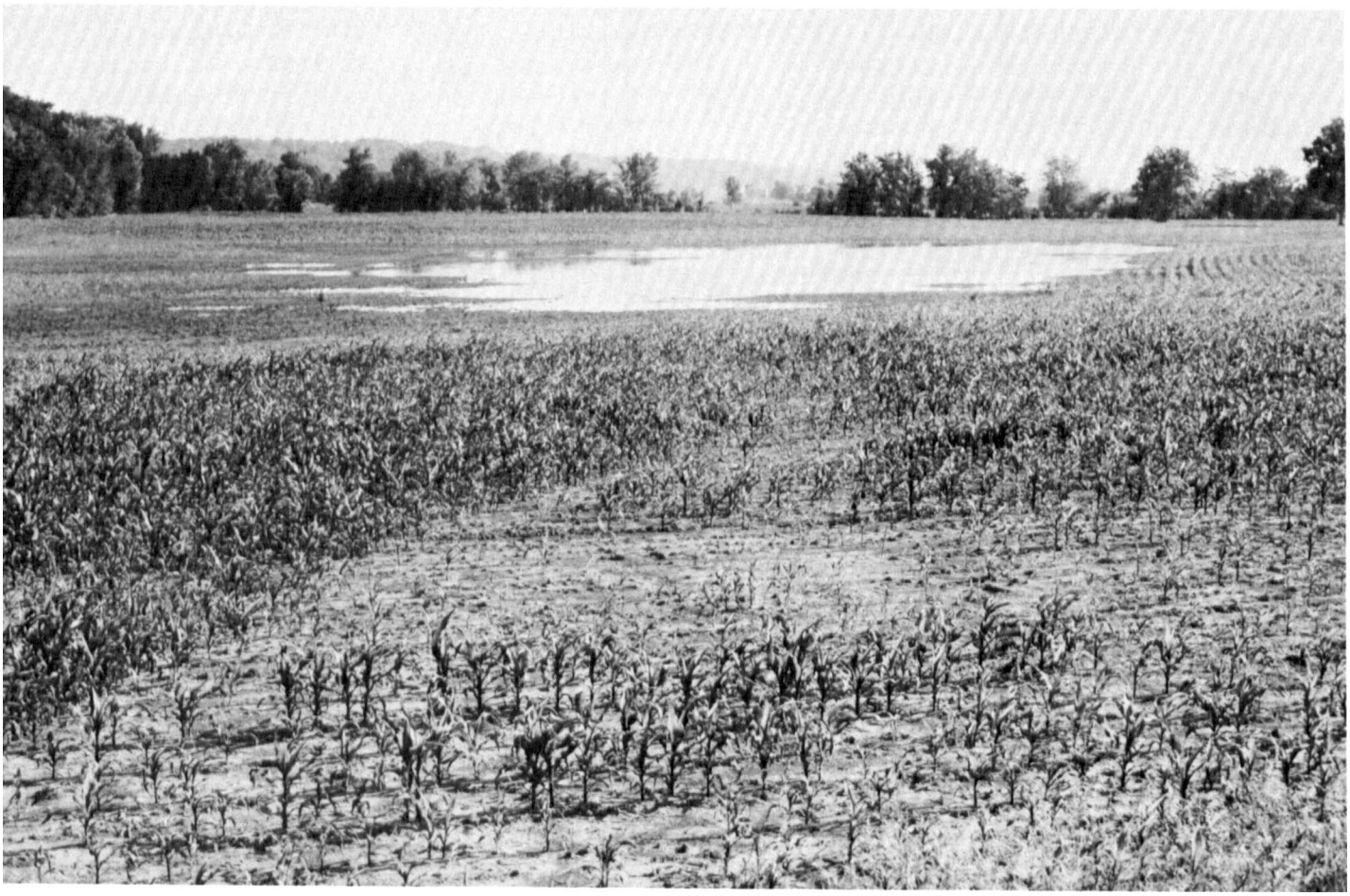


Figure 12.—A wet area of Coland clay loam, 0 to 2 percent slopes.

of tilth and thus reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is moderately suited to trees. It supports trees around farmsteads, but few areas are extensively wooded. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. The hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIw.

163B—Fayette silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on the sides and convex tops of ridges in the uplands. Areas are irregular in shape and mainly are 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown and dark grayish brown silt loam about 4 inches thick. The subsurface layer is dark grayish brown silt loam about 8 inches thick. The subsoil to a depth of about 60 inches is brown, friable silty clay loam.

Included with this soil in mapping are areas of the nearly level, somewhat poorly drained Keomah soils. These soils make up about 4 to 6 percent of the unit. Also included are a few sinkholes (fig. 13).

Permeability is moderate in the Fayette soil. Available water capacity is high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The subsoil is medium acid or strongly acid. It has a high supply of available phosphorus and a very low supply of available potassium.

Many areas are used for cultivated crops or hay and pasture. Some support native timber. This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface, terraces, and contour farming help to prevent excessive

Figure 13.—A sinkhole in an area of Fayette silt loam, 2 to 5 percent slopes.

soil loss. In places, however, contour farming or terracing is difficult because of short, irregular slopes. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of hay or pasture plants is effective in controlling erosion. In many areas pasture renovation is needed. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIe.

163C—Fayette silt loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on the convex tops and upper sides of ridges in the uplands. Areas are irregular in shape and mainly are 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is very dark grayish brown and dark grayish brown silt loam about 8 inches thick. The subsoil to a depth of about 60 inches is brown, yellowish brown, and dark yellowish brown, friable silt loam and silty clay loam.

Included with this soil in mapping are scattered areas of Clinton soils. These soils make up about 5 to 10 percent of the unit. Their subsoil contains more clay than that of the Fayette soil.

Permeability is moderate in the Fayette soil. Available water capacity is high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 1.0 to

1.5 percent in the surface layer. The subsoil is medium acid or strongly acid. It has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are used for hay, pasture, and woodland. Some are used for cultivated crops. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a severe hazard. A conservation tillage system that leaves crop residue on the surface, terraces, and contour farming help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of short, irregular slopes. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of hay and pasture plants is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

163C2—Fayette silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is on the convex tops and upper sides of ridges in the uplands. Areas are irregular in shape and mainly are 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. Plowing has mixed some of the yellowish brown silty clay loam subsoil with the surface layer. The subsoil is yellowish brown and dark yellowish brown, friable silty clay loam about 47 inches thick. The substratum to a depth of about 60 inches is yellowish brown silty clay loam. In places the subsoil contains more clay.

Permeability is moderate. Available water capacity is high. Surface runoff is medium. Tilth generally is fair. The content of organic matter is less than 0.5 percent in the surface layer. The subsoil is medium acid or strongly acid. It has a high supply of available phosphorus and a very low supply of available potassium.

Many areas are cultivated. Some have been cultivated in the past but are now used for hay and pasture. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, further erosion is a severe hazard. A conservation tillage system that leaves crop residue on the surface, terraces, and contour farming help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of short, irregular slopes. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of hay or pasture plants is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

163D—Fayette silt loam, 9 to 14 percent slopes. This strongly sloping, well drained soil is on the convex tops and upper sides of ridges in the uplands. Areas are irregular in shape and mainly are 5 to 10 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is friable silty clay loam about 44 inches thick. The upper part is brown, and the lower part is yellowish brown and dark yellowish brown. The substratum to a depth of about 60 inches is yellowish brown silty clay loam.

Permeability is moderate. Available water capacity is high. Surface runoff is rapid. Tilth generally is good. The content of organic matter is 0.5 to 1.0 percent in the surface layer. The subsoil is medium acid or strongly acid. It has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are used for timber, pasture, and hay. Some are used for cultivated crops. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a severe hazard. A conservation tillage system that leaves crop residue on the surface, terraces, and contour farming help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of short, irregular slopes. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of hay or pasture plants is effective in controlling erosion. In many areas pasture renovation is needed. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

172—Wabash silty clay, 0 to 2 percent slopes. This nearly level, very poorly drained soil is in low areas on wide bottom land. It is subject to flooding, but most areas are protected. Areas mainly are 20 to 100 or more acres in size and generally are irregular in shape.

Typically, the surface layer is black silty clay about 7 inches thick. The subsurface layer is black silty clay about 11 inches thick. The upper part of the subsoil is black and very dark gray, mottled, very firm silty clay. The lower part to a depth of about 60 inches is dark gray and dark grayish brown, mottled, firm silty clay.

This soil is very slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is very slow or ponded. Tilth generally is poor. The content of organic matter is 3.0 to 4.0 percent in the surface layer. The shrink-swell potential is very high. The subsoil is neutral. It generally has a high supply of available phosphorus and a medium supply of available potassium.

Most areas are used for cultivated crops. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, a drainage system is needed to reduce the wetness and provide aeration and a deep root zone for plants. A tile drainage system generally does not function satisfactorily because of the very slow permeability. In most areas a surface drainage system or open ditches are used to reduce the wetness. Even though most areas are protected by levees, flooding still occurs if the levees are breached by the floodwater. Returning crop residue to the soil or deferring fieldwork when the soil is wet improves fertility and tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

The capability subclass is IIIw.

173—Hoopeston sandy loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on low terraces along the major rivers. Areas are irregular in shape and mainly are 5 to 50 acres in size.

Typically, the surface layer is very dark brown sandy loam about 6 inches thick. The subsurface layer is very dark grayish brown and dark brown, mottled sandy loam about 11 inches thick. The upper part of the subsoil is brown, mottled, very friable sandy loam and loamy sand. The next part is dark grayish brown, mottled, very friable loamy sand. The lower part to a depth of about 60 inches is brown, mottled, very friable loamy sand. In places, the subsoil is dark brown and dark yellowish brown and the soil is not so wet.

This soil is moderately rapidly permeable in the upper part and rapidly permeable in the lower part. It has a seasonal high water table. Available water capacity is moderate. Surface runoff is slow. Tilth generally is good. The content of organic matter is 2.0 to 3.0 percent in the surface layer. The subsoil is medium acid or strongly acid. It has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. This soil is moderately suited to corn, soybeans, and small grain. It is droughty during some hot, dry periods because the available water capacity is moderate. Also, soil blowing is a hazard. A drainage system generally is not needed but in some areas improves the timeliness of fieldwork after periods of heavy rainfall. Leaving crop residue on the surface conserves moisture and helps to control soil blowing.

This soil is moderately suited to grasses and legumes for hay and pasture. Soil blowing is a hazard if overgrazing during hot, dry periods reduces the extent of the protective plant cover.

The capability subclass is IIs.

174—Bolan loam, 0 to 2 percent slopes. This nearly level, well drained soil is on stream terraces along the major rivers. Areas are irregular in shape and mainly are 10 to 50 acres in size.

Typically, the surface layer is very dark grayish brown loam about 9 inches thick. The subsurface layer is dark brown loam about 10 inches thick. The subsoil is about 31 inches thick. It is brown, mottled, friable loam in the upper part; brown, mottled, friable fine sandy loam in the next part; and brown and dark yellowish brown, very friable loamy fine sand in the lower part. The substratum to a depth of about 60 inches is brown and yellowish brown loamy fine sand. In places, the surface layer is fine sandy loam and the soil is slightly droughty.

Permeability is moderate in the surface layer, the subsurface layer, and the upper part of the subsoil and rapid in the lower part of the subsoil and the substratum. Available water capacity is moderate. Surface runoff is slow. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The subsoil is neutral to medium acid. It has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. It is droughty, however, because the available water capacity is moderate. Also, soil blowing is a hazard if cultivated crops are grown. A conservation tillage system that leaves crop residue on the surface conserves moisture and helps to control soil blowing. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to control soil blowing and prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. Soil blowing is a hazard, however, if overgrazing reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

The capability subclass is IIs.

174B—Bolan loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on stream terraces

along the major rivers. Areas are irregular in shape and mainly are 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown loam about 8 inches thick. The subsurface layer is dark brown loam about 9 inches thick. The subsoil is about 29 inches thick. It is brown, mottled, friable loam in the upper part; brown, mottled, friable fine sandy loam in the next part; and brown, very friable loamy fine sand in the lower part. The substratum to a depth of about 60 inches is brown and yellowish brown loamy fine sand. In places, the surface layer is fine sandy loam and the soil is slightly droughty.

Permeability is moderate in the surface layer, the subsurface layer, and the upper part of the subsoil and rapid in the lower part of the subsoil and the substratum. Available water capacity is moderate. Surface runoff is slow. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The subsoil is neutral to medium acid. It has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, soil blowing and erosion are hazards. Also, droughtiness is a limitation. A conservation tillage system that leaves crop residue on the surface helps to control soil blowing and erosion and conserves moisture. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to control soil blowing and prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. Soil blowing is a hazard, however, if overgrazing reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

The capability subclass is IIe.

175—Dickinson fine sandy loam, 0 to 2 percent slopes. This nearly level, well drained or somewhat excessively drained soil is on stream terraces. Areas are irregular in shape and mainly are 5 to 80 acres in size.

Typically, the surface layer is very dark grayish brown fine sandy loam about 7 inches thick. The subsurface layer is very dark grayish brown fine sandy loam about 9 inches thick. The subsoil is about 31 inches thick. It is dark brown and dark yellowish brown, very friable fine sandy loam in the upper part and dark yellowish brown, very friable loamy sand in the lower part. The substratum to a depth of about 60 inches is dark yellowish brown sand. In places, the surface layer is loamy fine sand and the soil is more droughty.

Permeability is moderately rapid in the surface layer, the subsurface layer, and the upper part of the subsoil and rapid in the lower part of the subsoil and the substratum. Available water capacity is moderate. Surface runoff is slow. Tilth generally is good. The content of organic matter is 1.0 to 1.5 percent in the surface layer. The subsoil is slightly acid or medium acid. It has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. This soil is moderately suited to corn, soybeans, and small grain. It is droughty. Also, it is subject to soil blowing if cultivated crops are grown. A conservation tillage system that leaves crop residue on the surface conserves moisture and helps to control soil blowing. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to control soil blowing and prevent deterioration of tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling soil blowing, but overgrazing during dry periods reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

The capability subclass is IIs.

175B—Dickinson fine sandy loam, 2 to 5 percent slopes. This gently sloping, well drained or somewhat excessively drained soil is on stream terraces. Areas are irregular in shape and mainly are 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown fine sandy loam about 7 inches thick. The subsurface layer is very dark grayish brown fine sandy loam about 9 inches thick. The subsoil is about 31 inches thick. It is dark brown and dark yellowish brown, very friable fine sandy loam in the upper part and dark yellowish brown, very friable loamy sand in the lower part. The substratum to a depth of about 60 inches is dark yellowish brown sand. In places, the surface layer is loamy fine sand and the soil is more droughty.

Included with this soil in mapping are some areas where the slope is short and more than 5 percent. These areas make up about 5 to 10 percent of the unit. They are adjacent to bottom land and commonly form the escarpment from the terrace to the bottom land. They are more susceptible to erosion than the Dickinson soil.

Permeability is moderately rapid in the upper part of the Dickinson soil and rapid in the lower part of the subsoil and the substratum. Available water capacity is moderate. Surface runoff is medium. Tilth generally is good. The content of organic matter is 1.0 to 1.5 percent in the surface layer. The subsoil is slightly acid or medium acid. It has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, soil blowing and erosion are hazards. Also, droughtiness is a limitation. A conservation tillage system that leaves crop residue on the surface conserves moisture and helps to control soil blowing and erosion. Returning crop residue to the soil

or regularly adding other organic material improves fertility and helps to control erosion and prevent deterioration of tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Soil blowing and erosion are hazards, however, if overgrazing during dry periods reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

The capability subclass is IIe.

179D2—Gara loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained or well drained soil is on the sides and convex tops of ridges in the uplands. Areas are irregular in shape and mainly are 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown loam about 8 inches thick. Plowing has mixed some of the dark yellowish brown subsoil with the surface layer. The subsoil is about 39 inches thick. It is dark yellowish brown, friable loam in the upper part and yellowish brown, mottled, firm clay loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In some areas the surface layer is thicker or darker.

Included with this soil in mapping are areas of the poorly drained or somewhat poorly drained Rinda soils on the upper parts of the landscape. These soils make up about 5 to 10 percent of the unit. Their subsoil is gray clay.

Permeability is moderately slow in the Gara soil. Available water capacity is high. Surface runoff is rapid. Tilth generally is fair. The content of organic matter is 0.5 to 1.5 percent in the surface layer. The subsoil is strongly acid to slightly acid. It has a low or very low supply of available phosphorus and a very low supply of available potassium.

Many areas are used for crops. Some are used for pasture or hay. Nearly all were used for row crops at some time in the past. This soil is poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, further erosion is a moderate hazard. If row crops are grown in most years, soil losses are severe. A conservation tillage system that leaves crop residue on the surface, terraces, and contour farming help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is moderately suited to trees. The hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IVe.

179E—Gara loam, 14 to 18 percent slopes. This moderately steep, moderately well drained or well drained soil is on convex side slopes in the uplands. Areas are irregular in shape and mainly are 5 to 20 acres in size.

Typically, the surface layer is very dark gray loam about 4 inches thick. The subsurface layer is very dark grayish brown and dark grayish brown loam about 8 inches thick. The subsoil is about 35 inches thick. It is dark yellowish brown, friable loam in the upper part and yellowish brown, mottled, firm clay loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam. In places plowing has mixed the upper part of the subsurface layer with the surface layer.

Included with this soil in mapping are areas of the poorly drained or somewhat poorly drained Rinda soils on the upper parts of the landscape. These soils make up about 5 to 10 percent of the unit. Their subsoil is gray clay.

Permeability is moderately slow in the Gara soil. Available water capacity is high. Surface runoff is rapid. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The subsoil is strongly acid to slightly acid. It has a low or very low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for pasture or woodland. This soil is generally unsuitable for cultivated crops because of a severe hazard of erosion. It is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

Many areas support native hardwoods. This soil is moderately suited to trees. Erosion and the equipment limitation are the main management concerns. Carefully selecting sites for logging trails or roads and laying out the trails or roads on the contour help to control erosion. Because of the slope, special logging equipment is needed. Also, caution is needed in operating this equipment. Seedlings generally survive and grow well.

The capability subclass is VIe.

179E2—Gara loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, moderately well drained or well drained soil is on convex side slopes in the uplands. Areas are irregular in shape and mainly are 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown loam about 8 inches thick. Plowing has mixed some of the dark yellowish brown subsoil with the surface layer. The subsoil is about 35 inches thick. It is dark yellowish brown, friable loam in the upper part and yellowish

brown, mottled, firm clay loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Included with this soil in mapping are areas of the poorly drained or somewhat poorly drained Rinda soils on the upper parts of the landscape. These soils make up 4 to 6 percent of the unit. Their subsoil is gray clay.

Permeability is moderately slow in the Gara soil. Available water capacity is high. Surface runoff is rapid. Tilth generally is fair. The content of organic matter is 0.5 to 1.0 percent in the surface layer. The subsoil is strongly acid to slightly acid. It has a low or very low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for hay and pasture. Some are used for row crops. Most have been cultivated at some time in the past. This soil generally is unsuitable for cultivated crops because of a severe hazard of erosion. It is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

Very few areas support native hardwoods. This soil is moderately suited to trees. Erosion and the equipment limitation are the main management concerns. Carefully selecting sites for logging trails or roads and laying out the trails or roads on the contour help to control erosion. Because of the slope, special logging equipment is needed. Also, caution is needed in operating this equipment. Seedlings generally survive and grow well.

The capability subclass is VIe.

180—Keomah silt loam, 1 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on the moderately wide or wide tops of upland ridges on the major stream divides. Areas are irregular in shape and mainly are 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown and grayish brown, mottled silt loam about 10 percent of the unit. They are wetter than the Keomah brown, mottled, firm and friable silty clay loam about 30 inches thick. The substratum to a depth of about 60 inches is dark grayish brown and dark brown, mottled silty clay loam.

Included with this soil in mapping are areas of soils that are on the more nearly level or slightly depressional parts of the landscape. These soils make up about 5 to 10 percent of the unit. They are wetter than the Kemoah soil. Their subsoil is grayish brown.

The Keomah soil is moderately slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow or very slow. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is medium acid or strongly acid. It has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, a drainage system is needed to reduce the wetness. Installing tile drains reduces the wetness. Erosion is a hazard in some cultivated areas. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent surface crusting and deterioration of tilth, and increases the rate of water infiltration.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing during wet periods, however, reduces the extent of the plant cover and causes surface compaction and deterioration of tilth.

A few areas remain in native hardwoods. This soil is well suited to trees. The hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIw.

208—Klum fine sandy loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on flood plains along the rivers and major streams. It is subject to flooding. Areas are elongated or irregular in shape and mainly are 5 to 100 acres in size.

Typically, the surface layer is very dark grayish brown fine sandy loam about 8 inches thick. The substratum to a depth of about 60 inches is stratified very dark grayish brown to grayish brown and brown sandy loam, loam, fine sandy loam, and silt loam.

Included with this soil in mapping are scattered small areas of the somewhat poorly drained Lawson soils. These soils make up about 5 to 10 percent of the unit. They contain more clay and organic matter than the Klum soil.

The Klum soil is moderately rapidly permeable. It has a seasonal high water table. Available water capacity is moderate. Surface runoff is slow. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The substratum is neutral. It has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. This soil is moderately suited to corn, soybeans, and small grain. It is droughty. Also, it is subject to soil blowing and flooding. Levees or dikes along stream channels help to control the floodwater. A conservation tillage system that leaves crop residue on the surface conserves moisture and helps to control soil blowing. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to control erosion and prevent surface crusting and deterioration of tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling soil blowing. Overgrazing, particularly during hot, dry periods, reduces the extent of the protective plant cover and thus increases the susceptibility to soil blowing. Proper stocking rates,

pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

The capability subclass is IIs.

220—Nodaway silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on flood plains along rivers and streams. It is subject to flooding. Areas are elongated or irregular in shape and mainly are 5 to 100 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The substratum to a depth of about 60 inches is very dark grayish brown, dark grayish brown, very dark gray, and grayish brown, mottled silt loam stratified with thin layers of loam, fine sandy loam, and silty clay loam. In some places the surface layer is loam. In other places the soil contains more sand.

This soil is moderately permeable. It has a seasonal high water table. Available water capacity is very high. Surface runoff is slow. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The substratum is neutral. It has a medium supply of available phosphorus and potassium.

Most areas are used for cultivated crops or hay and pasture. Some support trees. This soil is well suited to corn, soybeans, and small grain. If the soil is protected from flooding, cultivated crops can be grown in many years. The flooding generally occurs in March or April. In many places diversion terraces on adjacent foot slopes help to control the runoff from the higher areas. Returning crop residue to the soil and deferring tillage when the soil is wet help to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. Pasture management is difficult, however, because of the flooding. Permanent pasture can be improved by renovating and reseeding. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods, especially after periods of rainfall when the soil is flooded, help to keep the pasture in good condition.

A few areas support native hardwoods. This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIw.

222C—Clarinda silty clay loam, 5 to 9 percent slopes. This moderately sloping, poorly drained soil is on short, convex side slopes and in coves at the head of drainageways in the uplands. Areas are irregular in shape and mainly are 5 to 15 acres in size.

Typically, the surface layer is black silty clay loam about 7 inches thick. The subsurface layer is very dark grayish brown, mottled silty clay loam about 11 inches thick. The subsoil to a depth of about 60 inches is dark gray, mottled, and firm. It is silty clay loam in the upper part, silty clay in the next part, and clay in the lower part.

Included with this soil in mapping are areas of the gently sloping Colo soils. These soils make up about 5 to 10 percent of the unit. They are near the center of the mapped areas, generally on the lowest part of the landscape. They are less susceptible to erosion than the Clarinda soil.

The Clarinda soil is very slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is medium. Tilth generally is fair. The content of organic matter is 2.5 to 3.5 percent in the surface layer. The subsoil has a high shrink-swell potential. It is medium acid to neutral. It has a low supply of available phosphorus and a low or medium supply of available potassium.

Most areas are used for cultivated crops or hay and pasture. Some support grass. Areas of this soil generally are so small that they are farmed along with the surrounding soils. The soil is poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, wetness is a very serious limitation and erosion is a severe hazard. A conservation tillage system that leaves crop residue on the surface and contour farming help to prevent excessive soil loss. Installing interceptor tile in the more permeable soils upslope reduces the wetness of this soil. Returning crop residue to the soil or regularly adding other organic material improves tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

The capability subclass is IVw.

223C2—Rinda silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, poorly drained or somewhat poorly drained soil is on convex to plane side slopes and in coves at the head of upland drainageways. Areas are irregular in shape and mainly are 5 to 10 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. Plowing has mixed some of the dark grayish brown silty clay loam subsoil with the surface layer. The upper part of the subsoil is mottled dark grayish brown and brown, friable silty clay loam. The next part is dark gray and dark grayish brown, mottled, firm clay. The lower part to a depth of about 60 inches is dark grayish brown, mottled, firm silty clay. In places the surface layer is silty clay loam, is lighter colored, and contains less organic matter.

Included with this soil in mapping are areas of the moderately well drained Hedrick soils on the upper slopes. These soils make up about 5 to 10 percent of the unit. Their subsoil contains less clay than that of the Rinda soil.

The Rinda soil is very slowly permeable. It has a seasonal high water table. Available water capacity is

high. Surface runoff is medium. Tilth generally is fair. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is medium acid or strongly acid in the upper part. It has a low supply of available phosphorus and a low or medium supply of available potassium.

Most areas are used for cultivated crops or have been cultivated in the past. Some are used for hay or pasture. Areas of this soil generally are farmed along with the adjoining soils. The soil is poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, wetness is a very serious limitation and further erosion is a severe hazard. A conservation tillage system that leaves crop residue on the surface helps to prevent excessive soil loss. Installing interceptor tile in the more permeable soils upslope reduces the wetness in many areas. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

Very few areas support native hardwoods. This soil is poorly suited to trees because of the wetness. The main concerns of management are the equipment limitation, seedling mortality, and the windthrow hazard. Logging equipment should be used only during the drier periods or during the winter, when the ground is frozen. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow.

The capability subclass is IVe.

223D2—Rinda silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, poorly drained or somewhat poorly drained soil is on convex to plane side slopes and in coves at the head of upland drainageways. Areas are irregular in shape and mainly are 5 to 10 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. Plowing has mixed some of the dark grayish brown subsoil with the surface layer. The upper part of the subsoil is dark grayish brown and brown, mottled, friable silty clay loam. The next part is dark gray, mottled, firm clay. The lower part to a depth of about 60 inches is dark grayish brown, mottled, firm silty clay. In places the surface layer is dark yellowish brown silty clay loam and contains less organic matter.

Included with this soil in mapping are areas of the moderately well drained Hedrick soils on the upper slopes. These soils make up about 5 to 10 percent of the unit. They are not so steep as the Rinda soil. Also, their subsoil contains less clay.

The Rinda soil is very slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is rapid. Tilth generally is fair. The content of organic matter is 1.0 to 1.5 percent in the surface layer. The subsoil has a high shrink-swell potential. It is medium acid or strongly acid in the upper part. It has a low supply of available phosphorus and a low or medium supply of available potassium.

Most areas are used for hay and pasture. Areas of this soil are generally so small that they are farmed along with the adjoining soils. The soil is poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, wetness is a serious limitation and further erosion is a very severe hazard. A conservation tillge system that leaves crop residue on the surface helps to prevent excessive soil loss. Installing interceptor tile in the more permeable soils upslope reduces the wetness in many areas. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

Very few areas support native hardwoods. This soil is poorly suited to trees because of the wetness. The main concerns of management are the equipment limitation, seedling mortality, and the windthrow hazard. Logging equipment should be used only during the drier periods or during the winter, when the ground is frozen. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow.

The capability subclass is IVe.

263—Okaw silt loam, 0 to 2 percent slopes. This nearly level, poorly drained or very poorly drained soil is on low stream terraces along the major and minor streams. It is subject to flooding. Areas are irregular in shape and mainly are 5 to 25 acres in size.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsurface layer is light brownish gray, mottled silt loam about 7 inches thick. The subsoil is about 37 inches thick. It is grayish brown, mottled, friable silty clay loam in the upper part; grayish brown, mottled, firm silty clay loam in the next part; and light brownish gray, mottled, friable silty clay loam in the lower part. The substratum to a depth of about 60 inches is light brownish gray, mottled silty clay loam.

Included with this soil in mapping are scattered areas of soils that have a grayish brown or dark grayish brown subsoil. These soils make up 5 to 10 percent of the unit. They are better drained than the Okaw soil.

The Okaw soil is very slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is strongly acid or medium acid. It has a low supply of available phosphorus and a very low supply of available potassium.

Many areas are used for cultivated crops or hay and pasture. A few are used for woodland. This soil is moderately suited to corn, soybeans, and small grain. If the soil is protected from flooding, cultivated crops can be grown in most years. A subsurface drainage system is beneficial but functions slowly. In many places diversion terraces at the base of the slope help to control the runoff from the higher areas. Returning crop residue to the soil or regularly adding other organic material and deferring tillage when the soil is wet improve fertility and help to prevent deterioration of tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. Pasture management is difficult because of the flooding. Permanent pasture can be improved by renovating or reseeding. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

Some areas support native hardwoods. This soil is well suited to trees. The main concerns of management are the equipment limitation, seedling mortality, and the windthrow hazard. Logging equipment should be used only during the drier periods or during the winter, when the ground is frozen. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow.

The capability subclass is IIIw.

263B—Okaw silt loam, 2 to 5 percent slopes. This gently sloping, poorly drained or very poorly drained soil is on low stream terraces along the major and minor streams. It is subject to flooding. Areas are irregular in shape and mainly are 5 to 20 acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsurface layer is grayish brown and brown, mottled silt loam about 5 inches thick. The subsoil is about 34 inches thick. It is grayish brown, mottled, firm silty clay loam in the upper part and light brownish gray, mottled, friable silty clay loam in the lower part. The substratum to a depth of about 60 inches is light brownish gray, mottled silty clay loam. In places it is loam, sandy clay loam, or sandy loam.

Included with this soil in mapping are scattered areas of soils that have a grayish brown or dark grayish brown subsoil. These soils make up 5 to 10 percent of the unit. They are better drained than the Okaw soil.

The Okaw soil is very slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is strongly acid or medium acid. It has a low supply of available phosphorus and a very low supply of available potassium.

Many areas are used for cultivated crops. Some are used for hay and pasture. A few are used for woodland. This soil is poorly suited to corn, soybeans, and small grain. If the soil is protected from flooding, cultivated crops can be grown in most years. A subsurface drainage system is beneficial but functions slowly. In many places diversion terraces at the base of the slope help to control the runoff from the higher areas. Returning crop residue to the soil or regularly adding other organic material and deferring tillage when the soil is wet improve fertility and help to prevent deterioration of tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. Pasture management is difficult because of the flooding. Permanent pasture can be improved by renovating or reseeding. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

Some areas support native hardwoods. This soil is well suited to trees. The main concerns of management are the equipment limitation, seedling mortality, and the windthrow hazard. Logging equipment should be used only during the drier periods or during the winter, when the ground is frozen. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow.

The capability subclass is IIIw.

279—Taintor silty clay loam, 0 to 1 percent slopes. This nearly level, poorly drained soil is on broad upland divides. Areas are irregular in shape and mainly are 5 to 200 acres in size.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer is black, mottled silty clay loam about 15 inches thick. The subsoil is about 29 inches thick. The upper part is dark grayish brown, mottled, firm silty clay loam. The lower part is olive gray, mottled, friable silty clay loam. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam.

Included with this soil in mapping are small areas of Mahaska and Sperry soils. The somewhat poorly drained Mahaska soils are on slight rises. They make up less than 5 percent of the unit. The poorly drained or very poorly drained Sperry soils are in scattered slight

depressions where water tends to pond. They make up about 1 to 3 percent of the unit.

The Taintor soil is moderately slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is fair unless the soil has been worked when wet. The content of organic matter is 4.0 to 5.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It generally is medium acid or slightly acid. It generally has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. If the soil is adequately drained, row crops can be grown in most years. A drainage system is needed to reduce the wetness and provide aeration and a deep root zone for plants. Tile drains generally function satisfactorily, but in some areas suitable outlets are not available. Returning crop residue to the soil and deferring tillage when the soil is wet improve tilth.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing or restricted use during wet periods help to keep the pasture and the soil in good condition.

The capability subclass is IIw.

280—Mahaska silty clay loam, 1 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on narrow flats and on the moderately wide or wide tops of ridges in the uplands. Areas are irregular in shape and mainly are 10 to 80 acres in size.

Typically, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer is black and very dark grayish brown silty clay loam about 8 inches thick. The upper part of the subsoil is very dark grayish brown, friable silty clay loam. The next part is dark grayish brown, mottled, friable silty clay loam. The lower part to a depth of about 60 inches is mottled grayish brown and yellowish brown, friable silty clay loam.

Included with this soil in mapping are some areas of the very poorly drained or poorly drained Sperry and poorly drained Taintor soils on small flats. These soils make up less than 5 percent of the unit.

The Mahaska soil is moderately permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is good. The content of organic matter is 3.0 to 4.0 percent in the surface layer. The subsoil generally is medium acid or strongly acid. It has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. Row crops can be grown in most years. Most areas are adequately drained. In some areas, however, tile drains are needed to improve the timeliness of fieldwork in wet years. If cultivated, some areas are subject to erosion. Returning crop residue to the soil and delaying fieldwork when the soil is wet help to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

The capability class is I.

281B—Otley silty clay loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on the sides and convex tops of ridges in the uplands, generally adjacent to broad flats. Areas are irregular in shape and mainly are 5 to 50 acres in size.

Typically, the surface layer is very dark brown silty clay loam about 6 inches thick. The subsurface layer is very dark brown and dark brown silty clay loam about 8 inches thick. The subsoil is about 35 inches thick. It is brown, friable silty clay loam in the upper part; brown, mottled, firm silty clay loam in the next part; and grayish brown, yellowish brown, and dark grayish brown, mottled, friable silty clay loam in the lower part. The substratum to a depth of about 60 inches is dark grayish brown, brown, and strong brown, mottled silty clay loam. In places the soil is nearly level, is wetter, and has a dark grayish brown subsoil.

Permeability is moderate. Available water capacity is high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 2.5 to 3.5 percent in the surface layer. The subsoil has a high shrink-swell potential. It is medium acid. It has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are cultivated. This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a moderate hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of short, irregular slopes. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

The capability subclass is IIe.

281C2—Otley silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on the narrow tops and sides of loess-covered ridges in the uplands. Areas are irregular in shape and mainly are 5 to 40 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 8 inches thick. Plowing has mixed some of the dark yellowish brown subsoil with the surface layer. The subsoil is about 35 inches thick. The upper part is brown, friable silty clay loam; the next part is dark yellowish brown, mottled, firm silty clay loam; and the lower part is yellowish brown, mottled, friable silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silty clay loam.

Included with this soil in mapping are areas of Nira soils at the head of drainageways and on the lower side slopes. These soils make up 5 to 10 percent of the unit. Their subsoil is grayer in the lower part than that of the Otley soil. Also, it has a lower supply of available phosphorus.

Permeability is moderate in the Otley soil. Available water capacity is high. Surface runoff is medium. Tilth generally is fair. The content of organic matter is 1.5 to 2.5 percent in the surface layer. The subsoil has a high shrink-swell potential. It is medium acid. It has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops. Some are used for hay or pasture. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, further erosion is a hazard. A conservation tillage system that leaves crop residue on the surface during the winter, contour farming, and terraces help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of short, irregular slopes. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

The capability subclass is IIIe.

291—Atterberry silt loam, 1 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on the moderately wide tops of ridges in the uplands. Areas are irregular in shape and mainly are 5 to 50 acres in size.

Typically, the surface layer is very dark brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown, mottled silt loam about 5 inches thick. The subsoil to a depth of about 60 inches is brown and dark yellowish brown, mottled, friable silty clay loam. In places the surface layer is dark brown and brown and contains less organic matter.

This soil is moderately permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is good. The content of organic matter is 2.0 to 3.0 percent in the surface layer. The subsoil generally is medium acid. It has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. It generally can be intensively cropped. A subsurface drainage system generally is not needed. In many areas, however, it can improve the timeliness of fieldwork. Returning crop residue to the soil and deferring tillage when the soil is wet improve fertility and help to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet, however, causes surface compaction and deterioration of tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

Very few areas support native hardwoods. This soil is well suited to trees. The hazards or limitations that affect planting or harvesting are slight.

The capability class is I.

362—Haig silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on the tops of ridges in the uplands. Areas are irregular in shape and commonly range from 5 to 50 or more acres in size.

Typically, the surface layer is black silt loam about 8 inches thick. The subsurface layer is black and very dark gray, mottled silty clay loam about 9 inches thick. The upper part of the subsoil is dark gray, mottled, firm silty clay. The next part is dark gray and olive gray, mottled, firm silty clay. The lower part to a depth of about 60 inches is olive gray, mottled, firm silty clay loam. In some areas the surface layer is black silty clay loam.

Included with this soil in mapping are small depressional areas of wetter soils. These soils make up 5 to 10 percent of the unit. Draining these soils is more difficult than draining the Haig soil.

The Haig soil is slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is very slow. Tilth generally is fair or poor. The content of organic matter is 3.0 to 4.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is medium acid to neutral. It has a low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. If the soil is adequately drained, row crops can be grown in many years. Tile drains generally do not function very satisfactorily, however, because permeability is slow and because suitable outlets are not available. Open ditches, a surface drainage system, land shaping, and bedding help to remove surface water. Because the soil warms slowly in the spring and dries slowly after rainfall, fieldwork is delayed. If rainfall is heavy, planting also is delayed. Fall plowing improves the timeliness of fieldwork but increases the susceptibility to soil blowing. Leaving a roughened plowed surface and alternating plowed and unplowed strips help to control the soil

blowing. Chisel plowing areas where crop residue has been left on the surface also helps to control the soil blowing.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet, however, causes surface compaction and poor tilth and thus reduces the extent of the protective plant cover. An occasional year of meadow improves tilth and helps to control weeds and insects.

The capability subclass is IIw.

364B—Grundy silty clay loam, 1 to 4 percent slopes. This gently sloping, somewhat poorly drained soil is on the tops of ridges in the uplands. Areas are elongated and irregular in shape. They commonly range from 20 to 80 or more acres in size.

Typically, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer is very dark gray silty clay loam about 4 inches thick. The subsoil is about 42 inches thick. The upper part is dark grayish brown, mottled, friable silty clay loam. The next part is dark grayish brown and grayish brown, mottled, firm silty clay. The lower part is grayish brown, mottled, firm silty clay loam grading with depth to olive gray, mottled, friable silty clay loam. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam.

Included with this soil in mapping are small areas of the poorly drained Haig soils on the less sloping parts of the landscape. These soils make up 5 to 10 percent of the unit.

The Grundy soil is slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow or medium. Tilth generally is fair. The content of organic matter is 2.5 to 3.5 percent in the surface layer. The subsoil has a high shrink-swell potential. It generally is strongly acid to neutral. It has a very low or low supply of available phosphorus and a low or medium supply of available potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a hazard in the more sloping areas. Row crops can be grown in most years, however, if erosion is controlled. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. In places, however, contour farming or terracing is difficult because of undulating, short slopes. If terraces are built, cuts should not expose the clayey subsoil. Exposing the subsoil may result in seepy terrace channels. Grassed waterways help to prevent gully erosion. This slowly permeable soil tends to warm more slowly in the spring than the more permeable soils, and it dries more slowly after rains. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth and increases the rate of water infiltration.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and deterioration of tilth and thus reduces the extent of the protective plant cover.

The capability subclass is IIe.

424D—Lindley-Keswick loams, 9 to 14 percent slopes. These strongly sloping soils are on side slopes and convex ridgetops. The well drained Lindley soil is on the lower slopes, and the moderately well drained Keswick soil is on the upper slopes. Areas are about 60 percent Lindley soil and 30 percent Keswick soil. They are irregular in shape and range from 5 to 20 acres in size. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Lindley soil has a surface layer of very dark grayish brown loam about 4 inches thick. The subsurface layer is brown loam about 4 inches thick. The subsoil is about 52 inches thick. The upper part is dark yellowish brown, firm clay loam, and the lower part is yellowish brown, mottled, firm clay loam. The substratum, if it occurs, is yellowish brown, firm clay loam.

Typically, the Keswick soil has a surface layer of very dark gray loam about 4 inches thick. The subsurface layer is dark grayish brown loam about 8 inches thick. The upper part of the subsoil is yellowish red and strong brown, mottled, firm loam grading to clay loam. The lower part to a depth of about 60 inches is yellowish brown and strong brown, mottled, firm clay loam.

Included with these soils in mapping are some small areas of Clinton soils. These included soils make up about 5 to 10 percent of the unit. They are upslope from the Lindley and Keswick soils. Also, they contain less sand throughout.

The Lindley soil is moderately slowly permeable. The Keswick soil is slowly permeable. It has a seasonal high water table. Available water capacity is high in the Lindley soil and moderate in the Keswick soil. Surface runoff is rapid on both soils. Tilth generally is fair. The content of organic matter is about 1.0 to 1.5 percent in the surface layer of both soils. The subsoil is strongly acid or medium acid. It generally has a medium to very low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for hay and pasture. A few areas support native hardwoods. These soils are poorly suited to corn, soybeans, and small grain because erosion is a severe hazard. Row crops should not be grown often. A conservation tillage system that leaves crop residue on the surface and contour farming help to prevent excessive soil loss. Returning crop residue to the soils or regularly adding other organic material improves fertility and tilth.

These soils are moderately suited to grasses and legumes for hay and pasture. A cover of hay or pasture plants is very effective in controlling erosion. In most areas reseeding or pasture renovation is needed. Proper stocking rates and pasture rotation help to keep the pasture and the soils in good condition.

These soils are moderately suited to trees. The main management concern on the Keswick soil is the windthrow hazard. A drainage system that lowers the water table helps to prevent windthrow. The other hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IVe.

424D2—Lindley-Keswick loams, 9 to 14 percent slopes, moderately eroded. These strongly sloping soils are on short, convex side slopes and nose slopes in the uplands. The well drained Lindley soil is on the lower slopes, and the moderately well drained Keswick soil is on the upper slopes. Areas are about 60 percent Lindley soil and 30 percent Keswick soil. They are irregular in shape and range from 5 to 20 acres in size. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Lindley soil has a surface layer of dark grayish brown loam about 8 inches thick. Plowing has mixed some of the yellowish brown loam subsoil with the surface layer. The upper part of the subsoil is yellowish brown, friable loam. The lower part to a depth of about 60 inches is yellowish brown, mottled, firm clay loam.

Typically, the Keswick soil has a surface layer of brown loam about 8 inches thick. Plowing has mixed some of the yellowish red clay loam subsoil with the surface layer. The subsoil is mottled, firm clay loam about 48 inches thick. The upper part is yellowish red and strong brown, and the lower part is yellowish brown and strong brown. The substratum to a depth of about 60 inches is yellowish brown, mottled, firm clay loam.

Included with these soils in mapping are small areas of Ashgrove and Clinton soils. These included soils make up about 10 percent of the unit. The poorly drained or somewhat poorly drained Ashgrove soils are in coves at the head of drainageways. They contain more clay and less sand than the Lindley and Keswick soils. Clinton soils are on the upper side slopes. They contain less clay than the Lindley and Keswick soils.

The Lindley soil is moderately slowly permeable. The Keswick soil is slowly permeable. It has a seasonal high water table. Available water capacity is high in the Lindley soil and moderate in the Keswick soil. Surface runoff is rapid on both soils. Tilth generally is poor. The content of organic matter is less than 0.5 percent in the surface layer of the Lindley soil and about 0.5 to 1.0 percent in the surface layer of the Keswick soil. The subsoil is strongly acid or medium acid in both soils. It generally has a medium to very low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops or hay and pasture. All have been cultivated in the past. These soils are poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, further erosion is a severe hazard. Terraces, contour farming, and a conservation tillage system that leaves crop residue on the surface help to prevent excessive soil loss. Returning crop residue to the soils or regularly adding other organic material improves fertility and tilth and increases the rate of water infiltration.

These soils are moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Overgrazing, however, causes surface compaction, excessive runoff, and deterioration of tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soils in good condition.

These soils are moderately suited to trees. The main management concern on the Keswick soil is the windthrow hazard. A drainage system that lowers the water table helps to prevent windthrow. The other hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IVe.

425D—Keswick loam, 9 to 14 percent slopes. This strongly sloping, moderately well drained soil is on short, convex side slopes and nose slopes in the uplands. Areas are irregular in shape and mainly are 5 to 25 acres in size.

Typically, the surface layer is very dark gray loam about 4 inches thick. The subsurface layer is dark grayish brown loam about 8 inches thick. The upper part of the subsoil is yellowish red and strong brown, mottled, firm loam. The lower part to a depth of about 60 inches is yellowish brown and strong brown, mottled, firm clay loam.

Included with this soil in mapping are areas of the well drained Lindley soils on the lower slopes. These soils make up about 5 to 10 percent of the unit. They contain less clay in the subsoil than the Keswick soil.

The Keswick soil is slowly permeable. It has a seasonal high water table. Available water capacity is moderate. Surface runoff is rapid. Tilth generally is fair. The content of organic matter is 1.0 to 1.5 percent in the surface layer. The subsoil has a high shrink-swell potential. It is medium acid or strongly acid. It has a very low supply of available phosphorus and potassium.

This soil is poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a severe hazard. A conservation tillage system that leaves crop residue on the surface and contour farming help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improve fertility and tilth.

Most areas are used for pasture or hay. This soil is moderately suited to grasses and legumes for hay and pasture. A cover of these plants is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition. Pasture renovation or reseeding is needed in some areas.

Some small areas support native hardwoods. This soil is moderately suited to trees. The windthrow hazard is the main management concern. A drainage system that lowers the water table helps to prevent windthrow. The other hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IVe.

425D2—Keswick loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained soil is on short, convex side slopes and nose slopes in the uplands. Areas are irregular in shape and mainly are 5 to 25 acres in size.

Typically, the surface layer is brown loam about 8 inches thick. Plowing has mixed some of the yellowish red subsoil with the surface layer. The subsoil is mottled, firm clay loam about 48 inches thick. The upper part is yellowish red and strong brown, and the lower part is yellowish brown and strong brown. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Included with this soil in mapping are areas of the well drained Lindley soils on the lower slopes. These soils make up about 5 to 10 percent of the unit. Their subsoil contains less clay than that of the Keswick soil.

The Keswick soil is slowly permeable. It has a seasonal high water table. Available water capacity is moderate. Surface runoff is rapid. Tilth generally is fair or poor. The content of organic matter is 0.5 to 1.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is medium acid or strongly acid. It has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops or hay and pasture. This soil is poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, further erosion is a severe hazard. A conservation tillage system that leaves crop residue on the surface and contour farming help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is moderately suited to trees. The main management concern is the windthrow hazard. A drainage system that lowers the water table helps to prevent windthrow. The other hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IVe.

430—Ackmore silt loam, 0 to 2 percent slopes. This nearly level, poorly drained or somewhat poorly drained soil is on flood plains along the major streams and rivers and on alluvial fans. It is subject to flooding, but many areas are protected. Areas are irregular in shape and mainly are 10 to 50 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The substratum is stratified very dark grayish brown, dark grayish brown, and very dark gray, mottled silt loam about 17 inches thick. Below this to a depth of about 60 inches is a buried surface layer of black and very dark gray, mottled silty clay loam. In some areas the buried surface layer of black and very dark gray silty clay loam is as shallow as 12 inches.

This soil is moderately permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is good. The content of organic matter is 1.0 to 3.0 percent in the surface layer. The shrink-swell potential is high in the lower part of the substratum. The upper part of the substratum is neutral. It has a low supply of available phosphorus and a very low supply of potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. A subsurface drainage system generally is not needed but improves the timeliness of fieldwork in periods after heavy rainfall. Tile drains generally function satisfactorily if suitable outlets are available. Returning crop residue to the soil and delaying fieldwork when the soil is wet help to prevent deterioration of tilth. Leaving crop residue on the surface reduces the susceptibility to soil blowing. Even though many areas are protected by levees, flooding still occurs if the levees are breached by floodwater.

This soil is well suited to grasses and legumes for hay and pasture. Pasture management is difficult, however, because of the flooding. Permanent pasture can be improved by renovating and reseeding. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during periods of flooding help to keep the pasture and the soil in good condition.

A few areas still support timber. This soil is well suited to trees. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. The other hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIw.

453—Tuskeego silt loam, 1 to 3 percent slopes. This nearly level, poorly drained soil is on bottom land and concave, low foot slopes. It is subject to flooding. Areas are irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is very dark brown, mottled silt loam about 8 inches thick. The subsurface layer is dark gray, mottled silt loam about 10 inches thick. The subsoil to a depth of about 60 inches is mottled, firm silty clay loam. The upper part is dark gray, and the lower part is grayish brown and dark grayish brown. In places, the surface soil is darker and the subsoil contains less clay.

This soil is very slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is fair or good. The content of organic matter is 2.0 to 3.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is strongly acid or medium acid in the upper part. It has a very low supply of available phosphorus and potassium.

Most areas are cultivated. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, a subsurface and surface drainage system is needed to reduce the wetness, provide aeration and a deep root zone for plants, and improve the timeliness of fieldwork. In most areas measures that help to control the runoff from nearby soils are needed. Returning crop residue to the soil or regularly adding other organic material and delaying fieldwork when the soil is wet improve fertility and help to prevent deterioration of tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. The wetness restricts the types of grasses or legumes that can be grown. Grazing should be restricted when the soil is wet or flooded.

A few areas support native hardwoods. This soil is well suited to trees. The main concerns of management are the equipment limitation, seedling mortality, and the windthrow hazard. Logging equipment should be used only during the drier periods or during the winter, when the ground is frozen. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow.

The capability subclass is IIIw.

478G—Nordness-Rock outcrop complex, 25 to 40 percent slopes. This very steep map unit occurs as areas of Rock outcrop intermingled with areas of a shallow, well drained Nordness soil. It is on convex side slopes and escarpments in the uplands. Areas are about 65 percent Nordness soil and 25 percent Rock outcrop. They are irregular in shape and mainly are 20 to 80 acres in size. The Nordness soil and Rock outcrop occur as areas so small or so intricately mixed that mapping them separately is not practical.

Typically, the Nordness soil has a surface layer of very dark grayish brown silt loam about 2 inches thick. The subsurface layer is dark brown silt loam about 4 inches thick. The subsoil is about 9 inches thick. The upper part is brown, friable loam, and the lower part is brown, firm clay loam. Hard, fractured limestone bedrock is at a depth of about 15 inches. In some small areas the depth to limestone bedrock is less than 8 inches.

Typically, the Rock outcrop is limestone bedrock on the very steep faces of escarpments and on side slopes.

Included with the Rock outcrop and Nordness soil in mapping are some areas of Lindley soils. These soils make up about 10 percent of the unit. They generally are upslope from the Nordness soil and are not shallow to bedrock.

Permeability is moderate in the Nordness soil. Available water capacity is very low. Surface runoff is very rapid. Tilth generally is good. The content of organic matter is less than 0.5 percent in the surface layer. The subsoil is medium acid. It has a very low supply of available phosphorus and potassium.

Most areas support native hardwoods or are used as permanent pasture. This map unit is not suited to corn and soybeans or to grasses and legumes for hay and pasture because of the shallowness to limestone bedrock and the very steep slope. In pastured areas overgrazing reduces the extent of the plant cover and thus increases the runoff rate and the susceptibility to erosion. The main management needs are proper stocking rates, pasture rotation, and timely deferment of grazing, especially during the midsummer period when the plant cover is sparse.

This map unit is poorly suited to trees. The hazard of erosion, the equipment limitation, and seedling mortality are the main management concerns. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. Carefully selecting sites for logging trails or roads and laying out the trails or roads on the contour help to control erosion. Because of the slope, special logging equipment is needed. Also, caution is needed in operating this equipment.

The capability subclass is VIIs.

484—Lawson silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on flood plains along the rivers and streams. It is subject to flooding. Areas are elongated or irregular in shape. They generally range from 10 to 50 acres in size, but a few are about 100 acres in size.

Typically, the surface layer is very dark brown silt loam about 8 inches thick. The subsurface layer is very dark brown and black silt loam about 26 inches thick. The substratum to a depth of about 60 inches is stratified dark brown, very dark grayish brown, and dark grayish brown, mottled silt loam. In some areas the content of sand is higher. In other areas the depth to the stratified substratum is more than 36 inches.

Included with this soil in mapping are small areas of the poorly drained Colo soils. These soils make up 5 to 10 percent of the unit.

The Lawson soil is moderately permeable. It has a seasonal high water table. Available water capacity is very high. Surface runoff is slow. Tilth generally is good. The content of organic matter is 3.0 to 4.0 percent in the surface layer. The subsurface layer generally is neutral. It generally has a low supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops or hay and pasture. Some support trees. This soil is well suited to corn, soybeans, and small grain. Cultivated crops can be grown in most years. The flooding generally is brief. In many places diversion terraces on adjacent foot slopes help to control the runoff from the higher areas. Returning crop residue to the soil and delaying fieldwork when the soil is wet help to prevent deterioration of tilth and improve fertility.

This soil is well suited to grasses and legumes for hay and pasture. Pasture management is difficult, however, in the flooded areas. Proper stocking rates, pasture rotation, and timely deferment of grazing or restricted use during wet periods or following periods of flooding help to keep the pasture and the soil in good condition. Permanent pasture can be improved by renovating and reseeding.

Only a few areas support native hardwoods. This soil is well suited to trees. The hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIw.

499F—Nordness silt loam, 14 to 25 percent slopes. This moderately steep and steep, well drained soil is on convex side slopes in the uplands. Areas are irregular in shape and mainly are 5 to 40 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is about 9 inches thick. The upper part is brown, friable loam, and the lower part is brown, firm clay loam. Hard, fractured limestone bedrock is at a depth of about 15 inches. In places it is at or near the surface. In some areas the slope is less than 14 percent.

Included with this soil in mapping are some areas of Lindley soils on the upper side slopes. These soils make up 6 to 10 percent of the unit. They are deep to limestone bedrock and are not so droughty as the Nordness soil.

Permeability is moderate in the Nordness soil. Available water capacity is very low. Surface runoff is rapid. Tilth generally is good. The content of organic matter is less than 0.5 percent in the surface layer. The subsoil is medium acid. It has a very low supply of available phosphorus and potassium.

Most areas support native hardwoods. Some are used as pasture or wildlife habitat. This moderately steep and steep soil generally is unsuitable for cultivated crops because it is very highly susceptible to erosion. It is poorly suited to grasses and legumes for hay and pasture. A cover of pasture plants is effective in controlling erosion. Overgrazing, however, reduces the extent of the plant cover and thus increases the runoff rate and the susceptibility to erosion. The main management needs are proper stocking rates, pasture rotation, and timely deferment of grazing.

This soil is poorly suited to trees. The hazard of erosion, the equipment limitation, and seedling mortality are the main management concerns. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. Carefully selecting sites for logging trails or roads and laying out the trails or roads on the contour help to control erosion. Because of the slope, special logging equipment is needed. Also, caution is needed in operating this equipment.

The capability subclass is VIIs.

520—Coppock silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained or poorly drained soil is on low stream terraces and foot slopes along the major and minor streams and rivers. It is subject to flooding, but some areas are protected by levees. Areas are irregular in shape and mainly are 5 to 40 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. It has streaks and pockets of dark grayish brown subsurface material. The subsurface layer is dark grayish brown and grayish brown, mottled silt loam about 17 inches thick. The upper part of the subsoil is grayish brown and yellowish brown, mottled, firm and friable silty clay loam. The lower part to a depth of about 60 inches is dark grayish brown and yellowish brown, mottled, friable silty clay loam. In places the surface layer is dark grayish brown silt loam and contains less organic matter.

Included with this soil in mapping are areas of the poorly drained Tuskeego soils in small depressions. These soils make up about 5 to 10 percent of the unit. They cannot be drained so easily as the Coppock soil. Also, their subsoil contains more clay.

The Coppock soil is moderately permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is good. The content of organic matter is 1.5 to 2.5 percent in the surface layer. The subsoil is strongly acid or medium acid. It has a low supply of available phosphorus and a very low supply of available potassium.

Many areas are used for cultivated crops. Some are used for pasture. A few support native hardwoods. This soil is moderately suited to corn, soybeans, and small grain. If the soil is adequately drained and protected from flooding, row crops can be grown in most years. A subsurface drainage system functions satisfactorily if suitable outlets are available. Diversion terraces on adjacent foot slopes help to control the runoff from the higher areas.

This soil is moderately suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet causes surface compaction and deterioration of tilth and thus reduces the extent of the protective plant cover.

This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIw.

570B—Nira silty clay loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is in coves at the head of drainageways and on the convex tops and sides of ridges in the uplands. Areas are irregular in shape and mainly are 5 to 50 acres in size.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer is very dark grayish brown silty clay loam about 6 inches thick. The subsoil is mottled, friable silty clay loam about 32 inches thick. The upper part is brown, the next part is dark grayish brown and olive gray, and the lower part is grayish brown. The substratum to a depth of about 60 inches is grayish brown, mottled silty clay loam. In places the upper part of the subsoil is dark grayish brown.

Included with this soil in mapping are small areas of the somewhat poorly drained Mahaska soils. These soils make up about 5 to 10 percent of the unit. They generally are less sloping than the Nira soil.

Permeability is moderate in the Nira soil. Available water capacity is high. Surface runoff is medium. Tilth generally is fair. The content of organic matter is 2.5 to 3.5 percent in the surface layer. The subsoil is medium acid. It has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a moderate hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of hay or pasture plants is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

The capability subclass is IIe.

570C2—Nira silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is in coves at the head of drainageways and on short, convex side slopes in the uplands. Areas are irregular in shape and mainly are 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 8 inches thick. Plowing has mixed some of the brown subsoil with the surface layer. The subsoil is mottled, friable silty clay loam about 28 inches thick. The upper part is brown, the next part is dark grayish brown and olive gray, and the lower part is grayish brown. The substratum to a depth of about 60 inches is grayish brown, mottled silty clay loam. In places the upper part of the subsoil is dark grayish brown.

Included with this soil in mapping are areas of the poorly drained Clarinda soils on the lower slopes. These soils make up 5 to 10 percent of the unit. Their subsoil is gray clay.

Permeability is moderate in the Nira soil. Available water capacity is high. Surface runoff is medium. Tilth generally is fair. The content of organic matter is 1.5 to 2.5 percent in the surface layer. The subsoil is medium acid. It has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. Some are used for hay and pasture. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, further erosion is a severe hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

The capability subclass is IIIe.

571B—Hedrick silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is in coves at the head of drainageways and on convex side slopes in the uplands. Areas are irregular in shape and mainly are 5 to 40 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is mottled, friable silty clay loam about 33 inches thick. The upper part is brown, and the lower part is grayish brown. The substratum to a depth of about 60 inches is grayish brown, mottled silty clay loam.

Included with this soil in mapping are areas of the somewhat poorly drained Givin soils on the less sloping parts of the landscape. These soils make up 5 to 10 percent of the unit.

Permeability is moderate in the Hedrick soil. Available water capacity is high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 1.5 to 2.5 percent in the surface layer. The subsoil is strongly

acid. It has a medium supply of available phosphorus and a low supply of available potassium.

Many areas are used for cultivated crops or hay. Some are used for pasture or timber or are wasteland. This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a moderate hazard. A conservation tillage system that leaves crop residue on the surface and contour farming help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of hay or pasture plants is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIe.

571C2—Hedrick silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is in coves at the head of drainageways and on somewhat short, convex to plane side slopes in the uplands. Areas are irregular in shape and mainly are 5 to 40 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. Plowing has mixed some of the brown silty clay loam subsoil with the surface layer. The subsoil is mottled, friable silty clay loam about 37 inches thick. The upper part is brown, and the lower part is grayish brown. The substratum to a depth of about 60 inches is mottled silty clay loam. The upper part is grayish brown, and the lower part is dark grayish brown and grayish brown.

Included with this soil in mapping are areas of the poorly drained or somewhat poorly drained Rinda soils on the lower slopes. These soils make up 5 to 10 percent of the unit. Their subsoil contains more clay than that of the Hedrick soil.

Permeability is moderate in the Hedrick soil. Available water capacity is high. Surface runoff is medium. Tilth generally is fair. The content of organic matter is 1.0 to 1.5 percent in the surface layer. The subsoil is strongly acid. It has a medium supply of available phosphorus and a low supply of available potassium.

Most areas are used for cultivated crops or hay and pasture. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, further erosion is a severe hazard. A conservation tillage system that leaves crop residue on the surface and contour farming help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

A few areas support native hardwoods. This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

572B—Inton silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on short, convex to plane side slopes and in areas around the head of drainageways in the uplands. Areas are irregular in shape and mainly are 5 to 20 acres in size.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil is mottled, friable silty clay loam about 50 inches thick. The upper part is yellowish brown, the next part is grayish brown and brown, and the lower part is gray and light gray. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam.

Included with this soil in mapping are areas of the somewhat poorly drained Keomah soils on the less sloping parts of the landscape. These soils make up about 5 to 10 percent of the unit. Their subsoil contains more clay than that of the Inton soil.

Permeability is moderate in the Inton soil. Available water capacity is high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The subsoil is strongly acid. It has a medium supply of available phosphorus and a low supply of available potassium.

Some areas are used for cultivated crops or pasture. Some support native hardwoods. This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a hazard. Terraces, contour farming, and a conservation tillage system that leaves crop residue on the surface help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to control erosion and prevent surface crusting and deterioration of tilth, and increases the rate of water infiltration.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Overgrazing, however, causes surface compaction, excessive runoff, and deterioration of tilth and thus reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIe.

572C2—Inton silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on short, convex to nearly plane side slopes and in areas around the head of drainageways in the uplands. Areas are irregular in shape and mainly are 5 to 30 acres in size.

Typically, the surface layer is brown silt loam about 8 inches thick. Plowing has mixed some of the yellowish brown silty clay loam subsoil with the surface layer. The subsoil is mottled, firm and friable silty clay loam about 31 inches thick. The upper part is yellowish brown, the next part is grayish brown and yellowish brown, and the lower part is light brownish gray and light olive gray. The substratum to a depth of about 60 inches is light olive gray, mottled silty clay loam and silt loam.

Included with this soil in mapping are areas of the poorly drained or somewhat poorly drained Ashgrove soils on the lower slopes. These soils make up about 5 to 10 percent of the unit. Their subsoil contains more clay than that of the Inton soil.

Permeability is moderate in the Inton soil. Available water capacity is high. Surface runoff is medium. Tilth generally is fair. The content of organic matter is 0.5 to 1.0 percent in the surface layer. The subsoil is strongly acid. It has a medium supply of available phosphorus and a low supply of available potassium.

Many areas are used as woodland. Some are used for cultivated crops or pasture. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, further erosion is a hazard. Terraces, contour farming, and a conservation tillage system that leaves crop residue on the surface help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth, helps to prevent surface crusting, and increases the rate of water infiltration.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion. Overgrazing, however, causes surface compaction, excessive runoff, and deterioration of tilth and thus reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIIe.

730B—Nodaway-Cantril-Klum complex, 2 to 5 percent slopes. These gently sloping soils are on narrow stream bottoms. They are subject to flooding. The somewhat poorly drained Cantril soil is on foot slopes, and the moderately well drained Nodaway and Klum soils are in scattered areas adjacent to streams or drainageways. Areas are about 45 percent Nodaway soil, 25 percent Cantril soil, and 20 percent Klum soil. They are as much as a mile or more long but generally are only a few hundred feet wide. They range from 5 to 50 acres or more in size. The three soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Nodaway soil has a surface layer of very dark grayish brown silt loam about 10 inches thick. The substratum to a depth of about 60 inches is stratified very dark grayish brown, very dark gray, and grayish brown, mottled silt loam. It has some thin strata of loam, fine sandy loam, and silty clay loam.

Typically, the Cantril soil has a surface layer of very dark grayish brown loam about 7 inches thick. The subsurface layer is dark grayish brown, mottled loam about 5 inches thick. The subsoil is about 44 inches thick. It is grayish brown and brown, mottled, friable loam in the upper part and brown and grayish brown, mottled, friable clay loam in the lower part. The substratum to a depth of about 60 inches is mottled dark grayish brown and yellowish brown loam.

Typically, the Klum soil has a surface layer of very dark grayish brown fine sandy loam about 8 inches thick. The substratum to a depth of about 60 inches is stratified very dark grayish brown to grayish brown and brown loam, fine sandy loam, and silt loam.

Included with these soils in mapping are small areas of the somewhat poorly drained or poorly drained Coppock soils on the lower foot slopes. These included soils make up about 5 to 10 percent of the unit. They contain more clay than the Nodaway, Cantril, and Klum soils.

The Nodaway and Cantril soils are moderately permeable and the Klum soil moderately rapidly permeable. All three soils have a seasonal high water table. Available water capacity is very high in the Nodaway soil, high in the Cantril soil, and low or moderate in the Klum soil. Surface runoff is slow on the Nodaway and Klum soils and medium on the Cantril soil. Tilth generally is good in all three soils. The content of organic matter is about 1.0 to 2.0 percent in the surface layer of the Nodaway and Klum soils and 1.5 to 2.5 percent in the surface layer of the Cantril soil. The substratum of the Nodaway and Klum soils generally is neutral, and the subsoil of the Cantril soil is strongly acid. The Nodaway soil has a medium supply of available phosphorus and potassium. The subsoil of the Cantril soil has a low supply of available phosphorus and potassium. The substratum of the Klum soil has a very low supply of available phosphorus and potassium.

These soils are moderately suited to corn, soybeans, and small grain. Most areas are so narrow that cultivation is difficult. Because of the stream channels, they cannot be crossed by farm machinery. Cultivated crops can be grown in many years, but the floodwater or the runoff from the adjacent soils may damage the crops. In areas where row crops can be grown, diversion terraces help to control the runoff from the higher areas.

These soils are moderately suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and deterioration of tilth and thus reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

Many areas support timber. These soils are well suited to trees. Seedlings survive and grow well.

The capability subclass is IIw.

779—Kalona silty clay loam, 0 to 1 percent slopes. This nearly level, poorly drained soil is on broad flats in the uplands. Areas are irregular in shape and mainly are 50 to 300 acres in size.

Typically, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer is black silty clay loam about 8 inches thick. The subsoil is firm silty clay loam about 38 inches thick. The upper part is black and dark gray, and the lower part is mottled strong brown and olive gray. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam.

This soil is moderately slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is fair or poor. The content of organic matter is 5.0 to 6.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is slightly acid or neutral. It has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, a subsurface drainage system is needed to reduce the wetness and provide aeration and a deep root zone for plants. Tile drains function satisfactorily, but in some areas suitable outlets are not available. A surface drainage system is needed in some areas. Returning crop residue to the soil and delaying fieldwork when the soil is wet improve tilth.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet, however, causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

The capability subclass is IIw.

793—Bertrand silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on low stream terraces. Areas are irregular in shape and mainly are 5 to 50 acres in size.

Typically, the surface layer is brown silt loam about 10 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The upper part of the subsoil is dark yellowish brown, friable silt loam. The next part is dark yellowish brown, friable silty clay loam. The lower part to a depth of about 60 inches is brown and dark yellowish brown, friable loam and sandy loam.

Included with this soil in mapping are scattered areas of Dickinson soils on slight rises. These soils make up about 5 to 10 percent of the unit. They contain more sand and less clay throughout than the Bertrand soil. Also, they are slightly droughty.

Permeability is moderate in the Bertrand soil. Available water capacity is moderate or high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The subsoil is slightly acid to strongly acid. It has a medium supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops. Some are used for woodland. This soil is well suited to corn, soybeans, and small grain. Row crops can be grown in most years. A conservation tillage system that leaves crop residue on the surface helps to control soil blowing. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. Restricted grazing during dry periods or rotation grazing helps to keep the pasture and the soil in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability class is I.

793B—Bertrand silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on low stream terraces. Areas are irregular in shape and mainly are 5 to 30 acres in size.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is about 45 inches thick. It is dark yellowish brown, friable silt loam in the upper part; dark yellowish brown and brown, mottled, friable silt loam in the next part; and dark yellowish brown, friable sandy loam in the lower part. The substratum to a depth of about 60 inches is dark yellowish brown sandy loam and loamy sand. In places the soil is moderately sloping or strongly sloping and is subject to more severe erosion.

Included with this soil in mapping are scattered areas of Dickinson soils. These soils make up about 5 to 10 percent of the unit. They contain more sand and less clay throughout than the Bertrand soil. Also, they are slightly droughty.

Permeability is moderate in the Bertrand soil. Available water capacity is moderate or high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 0.5 to 1.0 percent in the surface layer. The subsoil is slightly acid to strongly acid. It has a medium

supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops. Some are used for woodland. This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a moderate hazard. Row crops can be grown in many years, however, if erosion is controlled. A conservation tillage system that leaves crop residue on the surface and contour farming help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of pasture plants or hay is effective in controlling erosion, particularly on short slopes in the moderately sloping or strongly sloping areas. Restricted grazing or rotation grazing during dry periods helps to keep the pasture and the soil in good condition.

A few small areas support native hardwoods. This soil is well suited to trees. Seedlings survive and grow well, and the hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIe.

795D2—Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, poorly drained or somewhat poorly drained soil is on convex to plane side slopes and in coves at the head of upland drainageways. Areas are irregular in shape and mainly are 5 to 20 acres in size.

Typically, the surface layer is dark brown and dark yellowish brown silty clay loam about 6 inches thick. Plowing has mixed some of the dark yellowish brown subsoil with the surface layer. The upper part of the subsoil is dark yellowish brown and grayish brown, mottled, friable silty clay loam. The next part is grayish brown and dark gray, mottled, firm silty clay. The lower part to a depth of about 60 inches is gray, mottled, firm clay loam.

Included with this soil in mapping are areas of the moderately well drained Inton soils on the upper slopes. These soils make up about 4 to 6 percent of the unit. Their subsoil contains less clay than that of the Ashgrove soil.

The Ashgrove soil is very slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is rapid. Tilth generally is poor or fair. The content of organic matter is 0.5 to 1.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is strongly acid to neutral. It has a low supply of available phosphorus and a very low supply of available potassium.

Many areas are used for hay and pasture. Some are used for woodland. A few are used for cultivated crops. This soil is poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a very severe hazard and wetness is a serious limitation. A conservation tillage system that leaves crop residue on the surface helps to prevent excessive soil loss. Installing interceptor tile in the more permeable soils upslope reduces the wetness in many areas. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is moderately suited to grasses and legumes for hay or pasture. A cover of pasture plants or hay is effective in controlling erosion. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

A few areas remain in native hardwoods. This soil is poorly suited to trees because of the wetness. The main concerns of management are the equipment limitation, seedling mortality, and the windthrow hazard. Logging equipment should be used only during the drier periods or during the winter, when the ground is frozen. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow.

The capability subclass is IVe.

834—Titus silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on flood plains along the major rivers. It is subject to flooding, but most areas are protected. Areas are irregular in shape and range from 40 to 300 acres in size.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer is very dark gray, mottled silty clay loam about 14 inches thick. The subsoil to a depth of about 60 inches is dark gray, mottled, firm silty clay loam.

This soil is moderately slowly permeable. It has a seasonal high water table. Available water capacity is moderate. Surface runoff is very slow. Tilth generally is fair or poor. The content of organic matter is 3.0 to 4.0 percent in the surface layer. The subsoil has a high shrink-swell potential. It is slightly acid or neutral. It has a low supply of available phosphorus and a very low supply of available potassium.

Almost all areas are used for cultivated crops. This soil is moderately suited to corn, soybeans, and small grain. Subsurface drains are needed to reduce the wetness and provide aeration and a deep root zone for plants. They generally function if closely spaced, but they drain the soil slowly. A surface drainage system also is needed. Even though most areas are protected, flooding still occurs if the levees are breached by floodwater. Returning crop residue to the soil and delaying fieldwork when the soil is wet help to prevent surface compaction and improve tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. Grasses and legumes that are tolerant of wet conditions should be selected for planting. A drainage system is needed in most areas.

Overgrazing or grazing during wet periods causes surface compaction.

The capability subclass is IIIw.

880B—Clinton silt loam, benches, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on high stream benches. Areas are irregular in shape and mainly are 5 to 15 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsurface layer is dark brown silt loam about 4 inches thick. The subsoil is about 34 inches thick. It is dark yellowish brown, friable silty clay loam in the upper part and dark brown, firm silty clay loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown silty clay loam. Coarse textured material is at a depth of about 5 to 7 feet.

Included with this soil in mapping are areas where slopes are short and are as much as 9 percent. These areas generally make up about 5 to 10 percent of the unit. They are around the edges of the mapped areas. They are more susceptible to erosion than the less sloping areas of the Clinton soil.

Permeability is moderately slow in the Clinton soil. Available water capacity is high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The subsoil is strongly acid or medium acid. It has a high supply of available phosphorus and a very low supply of available potassium.

Most areas are used for cultivated crops. Some are used for woodland. This soil is well suited to corn, soybeans, and small grain. If row crops are grown, erosion is a hazard. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility and helps to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. A cover of hay or pasture plants is effective in controlling erosion. Overgrazing, however, causes surface compaction, excessive runoff, and deterioration of tilth and thus reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

A few areas still support timber. This soil is well suited to trees. The hazards or limitations that affect planting or harvesting are slight.

The capability subclass is IIe.

893D2—Gara-Rinda complex, 9 to 14 percent slopes, moderately eroded. These strongly sloping soils are on short, convex side slopes and in coves at the head of drainageways in the uplands. The well drained or moderately well drained Gara soil is on the lower slopes, and the poorly drained or somewhat poorly drained Rinda soil is on the upper slopes. Areas are about 70 percent Gara soil and 20 percent Rinda soil. They are irregular in shape and range from 10 to 40 acres or more in size. The two soils occur as areas so small or so intricately mixed that mapping them separately is not practical.

Typically, the Gara soil has a surface layer of very dark gray loam about 8 inches thick. Plowing has mixed some of the dark yellowish brown subsoil with the surface layer. The subsoil is about 37 inches thick. The upper part is dark yellowish brown, friable loam, and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled clay loam.

Typically, the Rinda soil has a surface layer of very dark grayish brown silt loam about 8 inches thick. Plowing has mixed some of the yellowish brown silty clay loam subsoil with the surface layer. The upper part of the subsoil is yellowish brown, mottled, friable silty clay loam. The next part is dark gray, mottled, firm clay. The lower part to a depth of about 60 inches is dark grayish brown, mottled, firm silty clay. In places the subsoil is reddish brown clay loam.

Included with these soils in mapping are small areas of Ladoga soils on the upper part of the slopes. These included soils make up about 10 percent of the unit. They contain less sand than the Gara and Rinda soils.

The Gara soil is moderately slowly permeable. The Rinda soil is very slowly permeable. It has a seasonal high water table. Available water capacity is high in both soils. Surface runoff is rapid. Tilth generally is good or fair. The content of organic matter is 0.5 to 1.5 percent in the surface layer of the Gara soil and 1.0 to 1.5 percent in the surface layer of the Rinda soil. The shrink-swell potential is high in the subsoil of the Rinda soil. The subsoil of the Gara soil is strongly acid to slightly acid. It has a low or very low supply of available phosphorus and a very low supply of available potassium. The subsoil of the Rinda soil is strongly acid or medium acid in the upper part. It has a low supply of available phosphorus and a low or medium supply of available potassium.

Most areas are used for hay and pasture. Some are used for cultivated crops. Nearly all have been cultivated in the past. These soils are poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, further erosion is a severe hazard. A conservation tillage system that leaves crop residue on the surface and contour farming help to prevent excessive soil loss. Installing interceptor drains in the more permeable soils upslope from the Rinda soil reduces the wetness in many areas.

These soils are moderately suited to grasses and legumes for hay and pasture. A cover of hay or pasture plants is effective in controlling erosion. Overgrazing or

grazing during wet periods, however, causes surface compaction and reduces the extent of the plant cover and thus increases the runoff rate and the susceptibility to erosion. Proper stocking rates and timely deferment of grazing during wet periods help to keep the pasture and the soils in good condition.

A few areas support native hardwoods. The Gara soil is moderately suited to trees and the Rinda soil poorly suited. The hazards or limitations that affect planting or harvesting are slight in areas of the Gara soil. The equipment limitation, seedling mortality, and the windthrow hazard are the main management concerns in areas of the Rinda soil. Logging equipment should be used only during the drier periods or during the winter, when the ground is frozen. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow.

The capability subclass is IVe.

950—Niota Variant silty clay loam, 0 to 3 percent slopes. This nearly level, poorly drained soil is on stream terraces. Areas are irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 7 inches thick. The upper part of the subsoil is dark grayish brown, mottled, firm silty clay. The next part is brown, mottled, firm silty clay and clay. The lower part to a depth of about 60 inches is brown grading to dark reddish gray, firm silty clay. In places the subsoil is underlain by gravelly sandy clay loam or gravelly sandy loam.

This soil is very slowly permeable. It has a seasonal high water table. Available water capacity is moderate or high. Surface runoff is slow. Tilth generally is poor or fair. The content of organic matter is 1.5 to 2.5 percent in the surface layer. The subsoil has a high shrink-swell potential. It generally is strongly acid to slightly acid. It has a very low supply of available phosphorus and a medium supply of available potassium.

Most areas are used for cultivated crops. A few are used for hay and pasture. This soil is poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, a drainage system is needed to reduce the wetness and provide aeration and a deep root zone for plants. In some areas a surface drainage system is needed to remove the excess water and improve the timeliness of fieldwork. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. Grasses and legumes that grow well on wet soils should be selected for planting. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth and thus reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

A few small areas support native hardwoods. This soil is moderately suited to trees because of the wetness. The main concerns of management are the equipment limitation, seedling mortality, and the windthrow hazard. Logging equipment should be used only during the drier periods or during the winter, when the ground is frozen. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow.

The capability subclass is IIIw.

950D—Niota Variant silty clay loam, 7 to 14 percent slopes. This strongly sloping, poorly drained soil is on alluvial terraces. Areas mainly are 5 to 10 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 7 inches thick. The upper part of the subsoil is dark grayish brown, mottled, firm silty clay. The next part is brown, mottled, firm clay. The lower part to a depth of about 60 inches is brown grading to dark reddish gray, firm silty clay.

This soil is very slowly permeable. It has a seasonal high water table. Available water capacity is moderate or high. Surface runoff is rapid. Tilth generally is fair. The content of organic matter is 1.0 to 1.5 percent in the surface layer. The subsoil has a high shrink-swell potential. It generally is strongly acid to neutral. It has a very low supply of available phosphorus and a medium supply of available potassium.

Most areas support trees. A few are used for hay and pasture. This soil is poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a very severe hazard. A conservation tillage system that leaves crop residue on the surface and contour farming help to prevent excessive soil loss. A subsurface drainage system is needed in many areas. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is poorly suited to grasses and legumes for hay and pasture. Grasses and legumes that grow well on wet soils should be selected for planting. A cover of hay or pasture plants is effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction and poor tilth and thus reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

Many areas support native hardwoods. This soil is only moderately suited to trees because of the wetness. The main concerns of management are the equipment limitation, seedling mortality, and the windthrow hazard. Logging equipment should be used only during the drier

periods or during the winter, when the ground is frozen. Because they do not survive well, seedlings should be planted at close intervals. Thinning the stand helps to provide adequate growing space for the surviving trees. A drainage system that lowers the water table helps to prevent windthrow.

The capability subclass is IVe.

960—Shaffton loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on flood plains along the major rivers. It is subject to flooding, but most areas are protected. Areas are irregular in shape and mainly are 20 to 200 acres in size.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. The subsurface layer is very dark grayish brown loam about 5 inches thick. The subsoil is about 30 inches thick. It is dark grayish brown, brown, and dark yellowish brown, mottled loam in the upper part; grayish brown and brown, mottled fine sandy loam in the next part; and brown, mottled loamy fine sand in the lower part. The substratum to a depth of about 60 inches is pale brown, mottled fine sand and sand. In places the surface layer is silty clay loam or clay loam and dries more slowly following periods of rainfall.

This soil is moderately permeable in the upper part and very rapidly permeable in the substratum. It has a seasonal high water table. Available water capacity is moderate. Surface runoff is slow. Tilth generally is good. The content of organic matter is 2.0 to 4.0 percent in the surface layer. The subsoil is medium acid. It has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. It is subject to flooding, but most areas are protected by levees and diversion ditches. In most areas the seasonal high water table is lowered by an extensive drainage system. During dry periods the soil may be slightly droughty because the available water capacity is moderate. Also, soil blowing is a hazard. It can be controlled, however, by a conservation tillage system that leaves crop residue on the surface.

This soil is well suited to grasses and legumes for hay and pasture. Soil blowing is a hazard, however, if overgrazing during extended hot, dry periods reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, and deferment of grazing during the hot, dry periods help to keep the pasture in good condition.

The capability subclass is IIw.

961—Ambraw loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on flood plains along streams and rivers. It is subject to flooding. Areas are irregular in shape and mainly are 10 to 50 acres in size.

Typically, the surface layer is very dark gray loam about 11 inches thick. The subsurface layer is black loam about 9 inches thick. The subsoil is dark gray, mottled, friable loam about 30 inches thick. The substratum to a depth of about 60 inches is dark gray, mottled loam.

This soil is moderately permeable or moderately slowly permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is fair. The content of organic matter is 2.0 to 3.0 percent in the surface layer. The subsoil is slightly acid. It has a very low supply of available phosphorus and potassium.

Some areas are cultivated. Some are used for woodland or wildlife habitat. A few support native grasses. This soil is poorly suited to corn, soybeans, and small grain because it is frequently flooded during periods of heavy rainfall. In some areas diversion terraces are needed to help control local runoff. In other areas flood protection is needed. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is wet causes surface compaction and deterioration of tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

The capability subclass is Vw.

1273B—Olmitz Variant loam, 2 to 5 percent slopes. This gently sloping, moderately well drained or well drained soil is on slightly concave to plane foot slopes and at or near outlets of upland drainageways. Areas are irregular in shape and mainly are 5 to 20 acres in size.

Typically, the surface layer is dark brown loam about 6 inches thick. The subsurface layer is about 20 inches of dark brown, mottled loam and clay loam. The subsoil to a depth of about 60 inches is brown, friable clay loam. In places the surface layer is light colored loamy, sandy, and silty recent alluvium about 7 to 15 inches thick.

Permeability is moderate. Available water capacity is high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 1.0 to 3.0 percent in the surface layer. The subsoil is mildly alkaline. It has a very low supply of available phosphorus and potassium.

Many areas are used for cultivated crops. Some are used for hay and pasture. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a severe hazard. Also, the soil receives runoff from the adjoining steeper slopes. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to control erosion. Diversion terraces help to control the runoff from the adjoining higher slopes. Returning crop residue to the soil improves fertility and helps to prevent deterioration of tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. Overgrazing causes surface

compaction and thus increases the runoff rate and the susceptibility to erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

The capability subclass is IIe.

1273C—Olmitz Variant loam, 5 to 10 percent slopes. This moderately sloping, moderately well drained or well drained soil is on convex to plane foot slopes and at or near outlets of upland drainageways. Areas are irregular in shape and mainly are 0 to 40 acres in size.

Typically, the surface layer is dark brown loam about 6 inches thick. The subsurface layer is about 20 inches of dark brown, mottled loam and clay loam. The subsoil to a depth of about 60 inches is brown, friable clay loam.

Permeability is moderate. Available water capacity is high. Surface runoff is medium. Tilth generally is good. The content of organic matter is 1.0 to 3.0 percent in the surface layer. The subsoil is mildly alkaline. It has a very low supply of available phosphorus and potassium.

Many areas are cultivated. Some are used for hay and pasture. This soil is moderately suited to corn, soybeans, and small grain. If cultivated crops are grown, erosion is a severe hazard. Also, the soil receives runoff from the adjoining higher slopes. A conservation tillage system that leaves crop residue on the surface, contour farming, and terraces help to control erosion. Diversion terraces help to control the runoff from the adjoining higher slopes. Returning crop residue to the soil improves fertility and helps to prevent deterioration of tilth.

This soil is moderately suited to grasses and legumes for hay and pasture. Overgrazing causes surface compaction and thus increases the runoff rate and the susceptibility to erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

The capability subclass is IIIe.

1316—Fluvaquents, frequently flooded, 0 to 3 percent slopes. These nearly level, somewhat poorly drained to very poorly drained soils consist of recently deposited, highly stratified sediments. They are frequently flooded, and each time they are flooded, new sediments are added. The sediments vary in texture. They generally are loamy and sandy, but thin layers of other textures are common. Much of this unit is channeled and has low natural levees, sloughs, and small oxbows.

Permeability varies because of the many kinds of soil material. Available water capacity is low in some areas. The content of organic matter varies. Reaction generally is neutral or slightly acid.

Most areas support water-tolerant plants, but areas that are ponded for shorter periods support trees that can tolerate some wetness. These soils are best suited to wetland plants, trees, and wildlife habitat. They generally are unsuitable for cultivated crops, pasture, or hay, except in very dry years when the water level in the storage area is limited to the permanent pool.

The capability subclass is Vw.

1587—Dolbee silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on flood plains along the major rivers. It is subject to flooding, but most areas are protected. Areas are irregular in shape and mainly are 40 to 300 acres in size.

Typically, the surface layer is black silt loam about 8 inches thick. The subsurface layer is black and very dark gray, mottled silt loam about 10 inches thick. The subsoil to a depth of about 60 inches is mottled, friable silty clay loam. The upper part is very dark gray, and the lower part is dark gray.

Included with this soil in mapping are areas of Zook soils in small depressions or in old, meandering channels. These soils make up about 5 to 10 percent of the unit. They are slowly permeable. Their subsurface layer is thicker and darker than that of the Dolbee soil and contains more clay. Also, their surface layer contains more organic matter.

The Dolbee soil is moderately permeable. It has a seasonal high water table. Available water capacity is very high. Surface runoff is very slow. Tilth generally is fair or good. The content of organic matter is 2.0 to 3.0 percent in the surface layer. The subsoil is neutral. It has a very low supply of available phosphorus and potassium.

Nearly all areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. A subsurface drainage system is needed to reduce the wetness and provide aeration and a deep root zone for plants. It generally functions satisfactorily, but a surface drainage system also is needed in many areas. Even though most areas are protected, flooding still occurs if the levees are breached by floodwater. Returning crop residue to the soil and delaying fieldwork when the soil is wet help to prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. Grazing when the soil is wet, however, causes surface compaction and deterioration of tilth.

The capability subclass is IIw.

1826—Snider loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on stream terraces along the major and minor rivers. Areas are irregular in shape and mainly are 20 to 100 acres in size.

Typically, the surface layer is very dark brown loam about 9 inches thick. The subsurface layer is very dark brown and very dark grayish brown loam about 9 inches thick. The upper part of the subsoil is dark grayish brown, mottled, friable loam. The lower part to a depth of about 60 inches is grayish brown, mottled, friable silty clay loam. In places the lower part of the subsoil is sandy loam or loamy sand.

This soil is moderately permeable. It has a seasonal high water table. Available water capacity is high. Surface runoff is slow. Tilth generally is good. The content of organic matter is 2.0 to 3.0 percent in the surface layer. The subsoil is slightly acid or medium acid. It has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. A few small areas are used for permanent pasture. This soil is well suited to corn, soybeans, and small grain. A subsurface drainage system is seldom needed. In a few areas, however, it can improve the timeliness of fieldwork. The soil is subject to soil blowing under certain conditions. A conservation tillage system that leaves crop residue on the surface helps to control soil blowing. Returning crop residue to the soil or regularly adding other organic material helps to maintain fertility and prevent deterioration of tilth.

This soil is well suited to grasses and legumes for hay and pasture. There are no serious management problems in growing grasses and legumes.

The capability class is I.

2208—Klum fine sandy loam, calcareous, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on flood plains along the rivers and major streams. It is subject to flooding, but most areas are protected. Areas are irregular in shape and mainly are 100 to 200 acres in size.

Typically, the surface layer is dark brown fine sandy loam about 8 inches thick. The substratum to a depth of about 60 inches is stratified dark brown, brown, and dark grayish brown fine sandy loam, silt loam, loam, and loamy fine sand. In places the surface layer is loam or silt loam.

This soil is moderately rapidly permeable. It has a seasonal high water table. Available water capacity is low or moderate. Surface runoff is low. Tilth generally is good. The content of organic matter is 1.0 to 2.0 percent in the surface layer. The surface layer generally has free calcium carbonates. The substratum is mildly alkaline. It has a very low supply of available phosphorus and potassium.

Most areas are used for row crops and hay. This soil is moderately suited to corn, soybeans, and small grain. Row crops can be grown in many years. The main limitation is the low or moderate available water capacity. The soil is subject to soil blowing if it is plowed in the fall. It also is subject to flooding, but most areas are protected by levees and diversion ditches. Drainage generally is adequate. A conservation tillage system that leaves crop residue on the surface helps to control soil blowing and conserves moisture. Regularly adding organic material improves fertility, helps to prevent deterioration of tilth, and conserves moisture.

This soil is moderately suited to grasses and legumes for hay and pasture. Pasture management is difficult because the available water capacity is low or moderate. Permanent pasture can be improved by renovating and reseeding. Proper stocking rates, pasture rotation, and timely deferment of grazing during dry periods help to keep the pasture and the soil in good condition.

The capability subclass is IIs.

2226—Elrin loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on terraces along the major rivers. Areas are irregular in shape and mainly are 10 to 50 acres in size.

Typically, the surface layer is very dark brown loam about 5 inches thick. The subsurface layer is very dark brown, very dark grayish brown, and dark brown, mottled loam about 15 inches thick. The upper part of the subsoil is dark grayish brown, mottled, friable loam. The next part is dark grayish brown and dark yellowish brown, mottled, friable and very friable sandy loam. The lower part to a depth of more than 60 inches is dark yellowish brown and brown, mottled, very friable loamy sand.

This soil is moderately permeable in the upper part and rapidly permeable in the lower part. It has a seasonal high water table. Available water capacity is moderate. Surface runoff is slow. Tilth generally is good. The content of organic matter is 2.0 to 3.0 percent in the surface layer. The subsoil is strongly acid or medium acid. It has a very low supply of available phosphorus and potassium.

Most areas are used for cultivated crops. This soil is well suited to corn, soybeans, and small grain. It can be cropped intensively. It is slightly droughty, however, during some hot, dry periods because the available water capacity is moderate. Also, soil blowing is a hazard. A conservation tillage system that leaves crop residue on the surface conserves moisture and helps to control soil blowing.

This soil is suited to grasses and legumes for hay and pasture. Soil blowing is a hazard, however, if overgrazing during extended hot, dry periods reduces the extent of the protective plant cover. Proper stocking rates, pasture rotation, and deferment of grazing during the extended dry periods help to keep the pasture in good condition.

The capability subclass is IIs.

2484—Lawson silt loam, frequently flooded, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on flood plains along the major rivers. It is subject to flooding. Areas are irregular in shape and are several hundred acres in size.

Typically, the surface layer is very dark brown silt loam about 8 inches thick. The subsurface layer is very dark brown and black silt loam about 26 inches thick. The substratum to a depth of about 60 inches is stratified dark brown, very dark grayish brown, and dark grayish brown silt loam. In some places it is stratified dark brown

and very dark grayish brown silt loam. In other places it is as shallow as 20 inches.

Included with this soil in mapping are small areas of the poorly drained Colo soils. These soils make up about 5 to 12 percent of the unit. They contain more clay than the Lawson soil.

The Lawson soil is moderately permeable. It has a seasonal high water table. Available water capacity is very high. Surface runoff is slow. Tilth generally is good. The content of organic matter is 4.0 to 5.0 percent in the surface layer. The subsurface layer generally is neutral. It generally has a low supply of available phosphorus and a very low supply of available potassium.

This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture because it is frequently flooded. Measures that control the flooding are needed before crops can be grown or the soil can be used for hay and pasture.

Nearly all areas support native timber. This soil is well suited to trees. The hazards or limitations that affect planting or harvesting are slight.

The capability subclass is Vw.

4000—Urban land. This map unit is on nearly level bottom land and nearly level and gently sloping uplands and terraces in and around the city of Burlington. Areas are rectangular or irregular in shape and commonly range from 10 to 50 acres or more in size.

This map unit is covered by streets, parking lots, buildings, shopping centers, and other structures that obscure or alter the soils so that identification of the soil series is not feasible. In many areas the structures are built on cut or fill material that ranges from 2 to 4 feet or more in thickness. Most areas are drained by sewer systems, gutters, and drainage tile.

No capability class or subclass is assigned.

5010—Pits, sand and gravel. These are open pits from which sand and gravel have been removed. They are 20 to 30 feet deep. Most are still being mined. Areas are irregular in shape and are 20 to 60 acres in size.

Permeability varies but generally is moderately rapid to very rapid. Reaction typically ranges from strongly acid to neutral.

Water accumulates in most of the pits. Many of the inactive pits provide habitat for fish, and some are open to the public for fishing.

No capability class or subclass is assigned.

5030—Pits, limestone quarry. These are open pits from which limestone has been removed. Many are being mined. Some have been inactive for several years. Areas are irregular in shape and commonly range from 5 to 70 acres or more in size.

The soil material piled around or near the pits generally is as much as 40 feet high but in a few areas is higher. Slope ranges from moderately sloping to very steep. The soil material varies in texture but generally is loamy. In some areas it contains limestone fragments.

The soil material and slope vary considerably from area to area. Permeability ranges from moderately rapid to slow. Surface runoff ranges from medium to very rapid, depending on the slope. Reaction varies considerably but generally is strongly acid to neutral.

Many areas are abandoned, but reclamation is possible if the area is properly graded, shaped, and fertilized.

No capability class or subclass is assigned.

5040—Orthents, loamy. These are nearly level to moderately steep soils that have been used as borrow areas for construction. In some areas the original soil has been removed to a depth of 2 to 20 feet or more. The soils range from well drained to somewhat poorly drained, depending on the kind of material from which they were derived and the condition of the restored borrow area. Areas range from 4 to 20 acres in size.

Typically, the upper 5 feet is yellowish brown and grayish brown, friable silty clay loam. As much as 10 inches of topsoil has been redistributed, often unevenly, throughout some borrow areas. This topsoil is very dark brown or dark brown to very dark gray.

Permeability is slow or moderately slow. Available water capacity is moderate or high. Surface runoff is rapid to ponded. Unless the topsoil has been redistributed, the content of organic matter is very low. As a result, preparing a good seedbed is difficult. Reaction ranges from medium acid to neutral. The supply of available phosphorus and potassium generally is very low.

Most areas are used as permanent pasture or are wasteland. These soils commonly are not suited to cultivated crops. They generally are better suited to grasses and legumes for hay and pasture. The areas where topsoil has been redistributed are better suited to cultivation than the other areas. Erosion is a moderate or severe hazard if the more sloping areas are cultivated. A conservation tillage system that leaves crop residue on the surface helps to prevent excessive soil loss. Also, other measures that stabilize the soils are needed.

No capability class or subclass is assigned.

5080—Orthents, nearly level. These soils are in areas that have been used or are being used for sanitary landfills or dumps and in areas that have been filled with soil material, broken up concrete, and asphaltic road material. They range from excessively drained to somewhat poorly drained, depending on the type of material at and under the surface. Areas range from 20 to 100 acres in size.

Typically, the upper 5 feet is mixed dark brown and dark yellowish brown, friable silt loam and silty clay loam. In the northeastern part of Burlington, one area is yellowish brown and grayish brown, friable and firm loam

and clay loam that has fragments of concrete and asphalt 1 to 5 feet in size. In some areas the upper 5 feet contains iron and steel material and wood.

Permeability is moderate to very slow. Available water capacity is moderate or high. Surface runoff is slow or very slow. Tilth generally is poor. Unless the topsoil has been redistributed, the organic matter content is low or very low. Reaction generally is medium acid to neutral. The supply of phosphorus and potassium is very low.

Nearly all areas of these soils support a permanent cover of grasses, but some are used for industrial purposes. Some are suitable for permanent pasture, hay, and recreational purposes, depending on the underlying material and the amount of topsoil that has been redistributed.

No capability class or subclass is assigned.

prime farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. Because the supply of high quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cropland, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber or is available for those uses. The soil qualities, growing season, and moisture supply are those needed for a well managed soil economically to produce a sustained high yield of crops. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable, and the level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at local offices of the Soil Conservation Service.

About 147,320 acres throughout Des Moines County, or nearly 56 percent of the total acreage, meets the requirements for prime farmland. About 132,685 acres of this land is used for crops, mainly corn and soybeans. The crops grown on this land account for an estimated two-thirds of the local farm income each year.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, are droughty, cannot be easily cultivated, and generally are less productive.

The map units that are considered prime farmland in Des Moines County are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described in the section "Detailed soil map units."

Some soils that have a seasonal high water table qualify for prime farmland only in areas where this limitation has been overcome by a drainage system. Onsite evaluation is needed to determine whether or not a specific area of these soils is adequately drained.

The map units that meet the requirements for prime farmland are:

51	Vesser silt loam, 0 to 2 percent slopes (where drained)
54	Zook silty clay loam, 0 to 2 percent slopes (where drained)
56B	Cantril loam, 2 to 5 percent slopes (where drained)
74	Rubio silt loam, 0 to 2 percent slopes (where drained)
75	Givin silt loam, 1 to 3 percent slopes (where drained)
76B	Ladoga silt loam, 2 to 5 percent slopes
80B	Clinton silt loam, 2 to 5 percent slopes
122	Sperry silt loam, 0 to 1 percent slopes (where drained)
130	Belinda silt loam, 0 to 2 percent slopes (where drained)
131B	Pershing silt loam, 2 to 5 percent slopes (where drained) [1]
132B	Weller silt loam, 2 to 5 percent slopes
133	Colo silty clay loam, 0 to 2 percent slopes (where drained)
133B	Colo silty clay loam, 2 to 5 percent slopes (where drained)
135	Coland clay loam, 0 to 2 percent slopes (where drained)
158	Dorchester silt loam, 0 to 2 percent slopes
163B	Fayette silt loam, 2 to 5 percent slopes
172	Wabash silty clay, 0 to 2 percent slopes (where drained)
173	Hoopeston sandy loam, 0 to 2 percent slopes
174	Bolan loam, 0 to 2 percent slopes

174B Bolan loam, 2 to 5 percent slopes
175 Dickinson fine sandy loam, 0 to 2 percent slopes
175B Dickinson fine sandy loam, 2 to 5 percent slopes
180 Keomah silt loam, 1 to 3 percent slopes (where drained)
220 Nodaway silt loam, 0 to 2 percent slopes
279 Taintor silty clay loam, 0 to 1 percent slopes (where drained)
280 Mahaska silty clay loam, 1 to 3 percent slopes
281B Otley silty clay loam, 2 to 5 percent slopes
291 Atterberry silt loam, 1 to 3 percent slopes (where drained)
362 Haig silt loam, 0 to 2 percent slopes (where drained)
364B Grundy silty clay loam, 1 to 4 percent slopes
430 Ackmore silt loam, 0 to 2 percent slopes (where drained)
453 Tuskeego silt loam, 1 to 3 percent slopes (where drained)
484 Lawson silt loam, 0 to 2 percent slopes
520 Coppock silt loam, 0 to 2 percent slopes (where drained)
570B Nira silty clay loam, 2 to 5 percent slopes
571B Hedrick silt loam, 2 to 5 percent slopes
572B Inton silt loam, 2 to 5 percent slopes
779 Kalona silty clay loam, 0 to 1 percent slopes (where drained)
793 Bertrand silt loam, 0 to 2 percent slopes
793B Bertrand silt loam, 2 to 5 percent slopes
834 Titus silty clay loam, 0 to 2 percent slopes (where drained)
880B Clinton silt loam, benches, 2 to 5 percent slopes
960 Shaffton loam, 0 to 2 percent slopes
1273B Olmitz Variant loam, 2 to 5 percent slopes
1587 Dolbee silt loam, 0 to 2 percent slopes (where drained)
1826 Snider loam, 0 to 2 percent slopes
2226 Elrin loam, 0 to 2 percent slopes

[1] This soil generally is adequately drained because of the application of drainage measures or because of the incidental drainage that results from farming, roadbuilding, or other kinds of land development.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 154,000 acres in Des Moines County is used for row crops and small grain, according to the Iowa Agricultural Statistics of 1978. Of this total, about 91,000 acres is used for corn; 47,000 acres for soybeans; 7,200 acres for close-grown crops, mainly oats and wheat; and 8,300 acres for hay.

Food production could be increased by extending the latest crop production technology to all of the cropland in the county. This soil survey can greatly facilitate the application of such technology. The paragraphs that follow describe the main management concerns in the areas used for crops and pasture.

Soil erosion is the major problem on about one-half of the cropland and pasture in Des Moines County. If the slope is more than 3 percent, erosion is a hazard.

Loss of the surface layer through erosion is damaging for many reasons. Productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into a plow layer. Loss of the surface layer is especially damaging to soils that are shallow over bedrock because it restricts the root zone. Erosion also reduces the productivity of soils that tend to be droughty, such as Dickinson and Sparta soils. Sediment is dumped into streams as the soil surface erodes. Control of erosion helps to maintain the productivity of the soils and improves the quality of water for municipal use, for recreation, and for fish and wildlife by minimizing the pollution of streams.

Erosion control provides a protective plant cover, reduces the runoff rate, and increases the infiltration rate. A cropping system that keeps a plant cover on the surface for extended periods can hold soil losses to an amount that will not reduce the productive capacity of the soils. On livestock farms, where part of the acreage is pasture and hayland, including legumes and grasses in the cropping system not only provides nitrogen and improves tilth for the following crop but also reduces the risk of erosion on the more sloping soils (fig. 14).

In some areas of Ladoga and Clinton soils, slopes are so short, steep, and irregular that contour farming or terracing is not practical. On these soils a cropping system that provides a protective plant cover, a

Figure 14.—A pastured area of Clinton soils. A cover of pasture grasses helps to control erosion.

conservation tillage system that leaves crop residue on the surface, and sediment and water control basins are needed to help control erosion.

A conservation tillage system that leaves crop residue on the surface increases the infiltration rate, reduces the runoff rate, and helps to control erosion. It is effective on all of the tillable soils in the county. No-tillage for corn and soybeans, which is becoming more popular, is the most effective means of controlling erosion on continuous cropland (fig. 15).

Following are examples of the major kinds of conservation tillage. No-tillage is a system in which the seedbed is prepared and the seed planted in one operation. The surface is disturbed only in the immediate area of the planted seed row. A protective cover of crop residue is left on at least 90 percent of the surface. Till-plant also is a system in which the seedbed is prepared and the seed planted in one operation. Tillage is limited to a strip not wider than one-third of the row. A protective cover of crop residue is left on two-thirds of the surface. Chisel-disk or rotary tillage is a system in which the soil is loosened throughout the field and crop residue is partly incorporated into the soil. Preparing the seedbed and planting can be one or separate operations. Conservation tillage is not practical unless enough crop residue is left on the surface after planting to control erosion effectively.

Terraces reduce the length of slopes and the hazards of runoff and erosion. They are most practical on the somewhat poorly drained to well drained, gently sloping

and moderately sloping soils that have regular slopes. The gently sloping Mahaska and Otley soils are very well suited to terracing.

Contour farming or stripcropping helps to control erosion. It is most effective in areas where slopes are smooth and uniform, such as the areas of Otley and Nira soils around Yarmouth.

Soil blowing is a hazard on some soils, especially on the sandier soils, such as Sparta. It can damage such soils in a few hours if winds are strong and the soils are dry and have no plant cover or surface mulch. Maintaining a plant cover or surface mulch and keeping the surface rough through proper tillage minimize the damage caused by soil blowing.

A cover of pasture plants is effective in controlling erosion. The most common pasture plants are bromegrass, tall fescue, bluegrass, reed canarygrass, orchardgrass, switchgrass, big bluestem, indiangrass, alfalfa, birdsfoot trefoil, and ladino clover. Forage production can be enhanced by good management. The management needed on established stands includes applications of fertilizer, control of weeds and brush, rotation and deferred grazing in a full-season grazing system, proper stocking rates, and adequate livestock watering facilities. Erosion is a severe hazard if the protective plant cover is destroyed when the more sloping areas of pasture and hayland are renovated. If cultivated crops are grown prior to seeding, soil losses can be reduced by a system of conservation tillage that leaves crop residue on the surface, contour farming, and grassed waterways. Interseeding grasses and legumes into the existing sod eliminates the need for destroying the plant cover during seedbed preparation.

Soil drainage is a management concern if cultivated crops are grown on the more poorly drained soils. Poorly drained soils, such as Taintor and Kalona, make up about 20 percent of the county. In these soils a tile drainage system is needed. In the somewhat poorly drained soils, such as Mahaska and Givin, it is beneficial in some years because it improves the timeliness of

Figure 15.—No-till planted corn on Mahaska soils.

fieldwork. In some areas of the poorly drained Haig and very poorly drained Wabash soils, a tile drainage system alone is not sufficient because of the slow or very slow permeability. In these areas a surface drainage system is needed, either alone or in conjunction with a tile drainage system. Nearly all areas of the poorly drained or very poorly drained soils have some type of drainage system, but in some areas the present system is not adequate.

Soil fertility is affected by reaction and by the content of plant nutrients. It is naturally low in most of the upland soils in the county. Most of the upland soils are naturally acid. The soils on flood plains, such as Nodaway, Colo, and Spillville, are slightly acid to mildly alkaline.

Ladoga and Clinton soils on uplands are naturally acid. If these soils have never been limed, applications of ground limestone are needed to raise the pH level sufficiently for good growth of alfalfa and other crops that grow well only on nearly neutral soils. The supply of available potash is naturally very low in Ladoga, Hedrick, Clinton, Otley, Mahaska, and most of the other upland soils. The supply of available phosphorus in the subsoil is high in the timbered soils, such as Clinton, but is medium in Ladoga soils and low in Otley soils. Applications of lime and fertilizer should be based on results of soil tests, on the need of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime needed.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth generally are high in content of organic matter and are granular and porous.

Most of the soils used for crops in the county have a surface layer of silt loam to silty clay loam. Some soils, such as Clinton, are low in content of organic matter. Following periods of intense rainfall, a crust forms on the surface of these soils. The crust is hard when dry and hinders water infiltration. It also increases the runoff rate. Regularly adding crop residue, manure, and other organic material improves soil structure and helps to prevent surface crusting.

Fall plowing is not suitable on the light colored, timbered soils because a crust forms during the following winter and spring. If they are plowed in the fall, many of the soils are nearly as dense and hard at the time of planting as they were before they were plowed. Also, most of the more sloping soils are subject to soil blowing if they are fall plowed.

Field crops suited to the soils and climate of the county include many that are not commonly grown. Corn and soybeans are the most commonly grown crops. Grain sorghum, sunflowers, potatoes, sugar beets, sweet corn, popcorn, pumpkins, canning peas, canning beans, and navy beans can be grown if economic conditions are favorable. Oats is the most common close-growing crop. Rye, barley, buckwheat, wheat, and flax could be grown, and grass seed could be produced from bromegrass, redtop, bluegrass, switchgrass, big bluestem, and indiangrass.

Specialty crops that are grown commercially in the county are limited in extent. Most of the well drained soils are suitable for orchards and nursery plants. Soils in low lying areas where frost is frequent and air drainage is poor, however, generally are poorly suited to early vegetables, small fruits, and orchards. The latest information about growing specialty crops can be obtained from local offices of the Cooperative Extensive Service and the Soil Conservation Service.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (*14*). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider

possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on the soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and

strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection (fig. 16).

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, keep snow from blowing off the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The

Figure 16.—A windbreak on Hedrick and Rinda soils.

plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

recreation

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management,

and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, orchardgrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, apple, hawthorn, dogwood, hickory, blackberry, and elderberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a

landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 14 gives information on the soil properties and site features that affect water management. The degree

and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil

Figure 17.—A grassed waterway on Ladoga soils.

material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders or of organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as a high content of calcium carbonate. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity (fig. 17). Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances, such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture (*13*). These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 or 20 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2, 7*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

soil and water features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams and by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations generally can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavations.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate* or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*16*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 18, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udoll (*Ud*, meaning humid, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludolls (*Hapl*, meaning minimal horizonation, plus *udoll*, the suborder of the Mollisols that have a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Hapludolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*13*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*16*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Ackmore series

The Ackmore series consists of somewhat poorly drained or poorly drained, moderately permeable soils on flood plains or alluvial fans. These soils formed in recently deposited silty alluvium. The native vegetation was mixed prairie grasses and deciduous trees. The slope ranges from 0 to 2 percent.

The Ackmore soils are similar to the Nodaway soils and commonly are adjacent to the Lawson and Nodaway soils. Unlike the adjacent soils, they are underlain by a buried soil. The Lawson soils have a mollic epipedon.

They are in positions on the landscape similar to those of the Ackmore soils. The Nodaway soils generally are near stream channels.

Typical pedon of Ackmore silt loam, 0 to 2 percent slopes, in an area of cropland; 850 feet north and 2,460 feet west of the southeast corner of sec. 13, T. 72 N., R. 2 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; mixed with some dark grayish brown (10YR 4/2) material; moderate very fine granular structure; friable; neutral; abrupt smooth boundary.

C1—7 to 15 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; massive; horizontal cleavage planes; friable; neutral; clear smooth boundary.

C2—15 to 18 inches; stratified very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; few fine distinct yellowish brown (10YR 5/4) mottles; massive; horizontal cleavage planes; friable; neutral; clear smooth boundary.

C3—18 to 24 inches; very dark gray (10YR 3/1) silt loam; few fine faint dark grayish brown (10YR 4/2) and few fine distinct reddish brown (5YR 4/4) mottles; massive; horizontal cleavage planes; friable; few fine dark concretions (oxides); neutral; clear smooth boundary.

2Ab1—24 to 38 inches; black (10YR 2/1) silty clay loam; few fine distinct reddish brown (5YR 4/4) mottles; moderate very fine subangular blocky structure; friable; few fine dark concretions (oxides); neutral; gradual smooth boundary.

2Ab2—38 to 50 inches; black (10YR 2/1) silty clay loam; common fine distinct reddish brown (5YR 4/4) mottles; moderate fine subangular blocky structure; friable; few dark concretions (oxides); neutral; gradual smooth boundary.

2Ab3—50 to 60 inches; very dark gray (10YR 3/1) silty clay loam; few fine distinct brown (7.5YR 4/4) mottles; moderate fine and medium subangular blocky structure; friable; few dark concretions (oxides); neutral.

The depth to the 2Ab horizon ranges from 20 to 36 inches. The surface layer is 5 to 10 inches thick.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It ranges from medium acid to neutral. The C horizon has value of 3 to 5 and chroma of 1 or 2. It is silt loam or silty clay loam. It ranges from medium acid to neutral. The 2Ab horizon has value of 2 or 3 and chroma of 0 or 1. It is neutral or slightly acid.

Ambraw series

The Ambraw series consists of poorly drained, moderately permeable and moderately slowly permeable soils on flood plains. These soils formed in loamy alluvium. The native vegetation was prairie grasses. The slope ranges from 0 to 2 percent.

The Ambraw soils commonly are adjacent to the Lindley soils on side slopes in the uplands. The solum of the Lindley soils contains more clay than that of the Ambraw soils.

Typical pedon of Ambraw loam, 0 to 2 percent slopes, in an area of cropland; 320 feet south and 1,720 feet east of the northwest corner of sec. 11, T. 69 N., R. 4 W.

Ap—0 to 11 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

A—11 to 20 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak very fine granular structure; friable; slightly acid; gradual wavy boundary.

Bg1—20 to 25 inches; dark gray (10YR 4/1) loam; very dark gray (10YR 3/1) coatings on some peds; few fine faint brown (10YR 4/3) mottles; weak very fine subangular blocky structure; friable; slightly acid; gradual wavy boundary.

Bg2—25 to 36 inches; dark gray (10YR 4/1) loam; few fine faint dark brown (7.5YR 4/4) mottles; weak very fine subangular blocky structure; friable; slightly acid; gradual wavy boundary.

BCg—36 to 50 inches; dark gray (10YR 4/1) loam; few fine faint gray (10YR 5/1) and common fine distinct dark brown (7.5YR 4/4) mottles; weak coarse prismatic structure; friable; slightly acid; gradual wavy boundary.

Cg—50 to 60 inches; dark gray (10YR 4/1) loam; few fine faint gray (10YR 5/1) and common medium distinct dark brown (7.5YR 4/4) mottles; massive; friable; slightly acid.

The thickness of the solum ranges from 45 to 60 inches. The thickness of the mollic epipedon ranges from 12 to 24 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is loam or clay loam. It is slightly acid or neutral. The B horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 0 or 1. It is loam, clay loam, or sandy clay loam. It is slightly acid or medium acid. The C horizon is slightly acid or neutral. The texture of this horizon varies.

Ashgrove series

The Ashgrove series consists of poorly drained or somewhat poorly drained, very slowly permeable soils. These soils are on short, convex side slopes and in coves at the upper end of drainageways in the uplands.

They formed in a thin mantle of loess and in the underlying clayey and loamy weathered glacial till. The native vegetation was deciduous trees. The slope ranges from 9 to 14 percent.

The Ashgrove soils are similar to the Rinda soils and commonly are adjacent to the Clinton, Inton, and Lindley soils. The Clinton soils are on ridgetops and the upper side slopes. They contain less clay and more silt throughout the solum than the Ashgrove soils. Also, their B horizon has a higher chroma. The Inton soils are on the upper side slopes. They contain less clay and more silt throughout the solum than the Ashgrove soils. The Lindley soils are on the lower side slopes. They contain less clay and more sand throughout the solum than the Ashgrove soils. Also, their B horizon has a higher chroma. Rinda soils are in positions on the landscape similar to those of the Ashgrove soils. Their A horizon is thicker than that of the Ashgrove soils, or their Ap horizon is darker.

Typical pedon of Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded, in an area of cropland; 1,170 feet east and 35 feet north of the southwest corner of sec. 32, T. 72 N., R. 2 W.

Ap—0 to 6 inches; mixed dark brown (10YR 3/3) and dark yellowish brown (10YR 4/4) silty clay loam, pale brown (10YR 6/3) dry, brown (10YR 4/3) kneaded; few fine distinct yellowish brown (10YR 5/6) mottles; weak very fine granular structure; friable; neutral; abrupt smooth boundary.

Bt—6 to 12 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; moderate very fine subangular blocky structure; friable; very thin nearly continuous clay films; very pale brown (10YR 7/3) sand and silt coatings on some peds when dry; few small pipestems; medium acid; clear smooth boundary.

Btg1—12 to 16 inches; grayish brown (10YR 5/2) silty clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; moderate very fine subangular blocky structure; friable; very thin nearly continuous clay films; very pale brown (10YR 7/3) sand and silt coatings on some peds when dry; few fine dark concretions (oxides); medium acid; abrupt smooth boundary.

2Btg2—16 to 22 inches; grayish brown (10YR 5/2) silty clay; dark grayish brown (10YR 4/2) coatings on faces of peds; few fine prominent yellowish brown (10YR 5/6) mottles; moderate very fine subangular blocky structure; firm; thin nearly continuous clay films; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

2Btg3—22 to 29 inches; grayish brown (2.5Y 5/2) silty clay; dark grayish brown (10YR 4/2) coatings on faces of peds; common fine and few medium prominent yellowish brown (10YR 5/6) and few fine prominent yellowish red (5YR 4/6) mottles; strong very fine subangular blocky structure; firm; thin nearly continuous clay films; few fine dark concretions (oxides); medium acid; gradual smooth boundary.

2Btg4—29 to 39 inches; dark gray (10YR 4/1) silty clay; common fine prominent yellowish brown (10YR 5/6) and few medium prominent reddish brown (5YR 4/4) mottles; strong very fine subangular blocky structure; firm; thin nearly continuous clay films; few fine dark concretions (oxides); slightly acid; clear smooth boundary.

2Btg5—39 to 51 inches; dark gray (10YR 4/1) silty clay; many fine prominent dark yellowish brown (10YR 4/4) and few fine prominent reddish brown (2.5YR 4/4) mottles; strong very fine subangular blocky structure; firm; thin nearly continuous clay films; few fine dark concretions (oxides); neutral; clear smooth boundary.

2BCg—51 to 60 inches; gray (5Y 5/1) clay loam; dark gray (10YR 4/1) coatings on faces of some peds; few fine prominent strong brown (7.5YR 5/6), few fine prominent yellowish red (5YR 4/6), and few medium prominent yellowish brown (10YR 5/6) mottles; strong very fine subangular blocky structure; firm; few fine dark concretions (oxides); neutral.

The thickness of the solum ranges from 42 to more than 60 inches. The Ap horizon has value and chroma of 3 or 4. It typically is silty clay loam but ranges to silt loam. The A and E horizons, if they occur, dominantly are silt loam but range to silty clay loam. They range from very strongly acid to neutral. The A horizon is less than 6 inches thick. It has value of 3 or 4 and chroma of 1 or 2. The E horizon has value of 4 or 5 and chroma of 2 or 3. The 2Btg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2.

Atterberry series

The Atterberry series consists of somewhat poorly drained, moderately permeable soils on ridgetops in the uplands. These soils formed in loess. The native vegetation was mixed prairie grasses and deciduous trees. The slope ranges from 1 to 3 percent.

The Atterberry soils commonly are adjacent to the well drained Fayette soils on the narrow tops and upper sides of ridges. The Fayette soils have a higher chroma in the B horizon than the Atterberry soils. Also, their surface layer is thinner or lighter colored.

Typical pedon of Atterberry silt loam, 1 to 3 percent slopes, in an area of cropland; 90 feet east and 1,265

feet north of the southwest corner of sec. 16, T. 69 N., R. 2 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate very fine granular structure; friable; neutral; clear smooth boundary.

E—8 to 13 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; very dark grayish brown (10YR 3/2) and very dark brown (10YR 2/2) coatings on faces of some plates; common fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; moderate thick platy structure parting to moderate very fine subangular blocky; friable; neutral; clear smooth boundary.

Bt1—13 to 18 inches; brown (10YR 4/3) silty clay loam; some pale brown (10YR 6/3) coatings on faces of peds when dry; common fine faint dark grayish brown (10YR 4/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine subangular blocky structure; friable; thin patchy clay films; few fine dark concretions (oxides); slightly acid; clear smooth boundary.

Bt2—18 to 25 inches; brown (10YR 4/3) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of peds; many fine faint dark grayish brown (10YR 4/2) and common fine distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate very fine subangular blocky structure; friable; pale brown (10YR 6/3) silt coatings on faces of peds when dry; thin nearly continuous clay films; few fine dark concretions (oxides); medium acid; gradual smooth boundary.

Bt3—25 to 35 inches; dark yellowish brown (10YR 4/4) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of peds; common fine faint dark grayish brown (10YR 4/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine subangular blocky structure; friable; thin nearly continuous clay films; pale brown (10YR 6/3) coatings on faces of peds when dry; few fine dark concretions (oxides); medium acid; gradual smooth boundary.

Bt4—35 to 44 inches; brown (10YR 4/3) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of most peds; many fine faint dark grayish brown (10YR 4/2) and few fine distinct dark brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; friable; thin nearly continuous clay films; common fine dark concretions (oxides); medium acid; gradual smooth boundary.

Bt5—44 to 57 inches; brown (10YR 4/3) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of most peds; many fine faint dark grayish brown (10YR 4/2) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; friable; thin patchy clay films; common fine dark concretions; slightly acid; gradual smooth boundary.

BC—57 to 60 inches; brown (10YR 4/3) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of most peds; many fine faint dark grayish brown (10YR 4/2) mottles; weak medium prismatic structure; friable; slightly acid.

The thickness of the solum ranges from 50 to more than 60 inches. The Ap or A horizon is 6 to 10 inches thick. It has value of 2 or 3 and chroma of 1 or 2. It is medium acid to neutral. The E horizon has value of 4 to 6 and chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is strongly acid to slightly acid.

Belinda series

The Belinda series consists of poorly drained, very slowly permeable soils on upland ridgetops. These soils formed in loess. The native vegetation was mixed prairie grasses and deciduous trees. The slope ranges from 0 to 2 percent.

The Belinda soils are similar to the Niota Variant and Rubio soils and commonly are adjacent to the Pershing and Weller soils. The Niota Variant soils do not have an E horizon. They formed in alluvium. The Pershing and Weller soils are on narrow ridgetops and side slopes. They are better drained and more sloping than the Belinda soils. Also, their B horizon is browner. The Rubio soils contain less clay in the B horizon than the Belinda soils.

Typical pedon of Belinda silt loam, 0 to 2 percent slopes, in a cultivated field; 695 feet west and 1,240 feet north of the center of sec. 31, T. 70 N., R. 4 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; mixed with some streaks and patches of dark grayish brown (10YR 4/2) subsurface material; weak very fine granular structure; friable; neutral; abrupt smooth boundary.

E1—8 to 12 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; few fine faint brown (10YR 5/3) and yellowish brown (10YR 5/4) mottles; moderate thin platy structure parting to moderate very fine granular; friable; few fine dark concretions (oxides); neutral; clear smooth boundary.

E2—12 to 18 inches; grayish brown (10YR 5/2) silt loam, pale brown (10YR 6/3) dry; dark grayish brown (10YR 4/2) coatings on faces of peds; few fine distinct yellowish brown (10YR 5/4) mottles; moderate thin platy structure parting to moderate very fine subangular blocky; friable; medium acid; few fine dark concretions (oxides); gradual smooth boundary.

Bt1—18 to 24 inches; dark grayish brown (10YR 4/2) silty clay; common fine faint dark gray (5Y 4/1) and common fine prominent strong brown (7.5YR 5/6) mottles; strong fine subangular and angular blocky structure; firm; very thin nearly continuous clay films on faces of peds; pale brown (10YR 6/3) silt coatings on faces of peds when dry; few fine and medium dark concretions (oxides); few very dark gray (10YR 3/1) stains on faces of some peds; strongly acid; gradual smooth boundary.

Bt2—24 to 31 inches; dark grayish brown (10YR 4/2) silty clay; common fine distinct yellowish brown (10YR 5/6) mottles; strong fine subangular blocky structure; firm; thin continuous clay film on faces of peds; few fine and medium dark concretions (oxides); few very dark gray (10YR 3/1) coatings on faces of some peds; strongly acid; gradual smooth boundary.

Bt3—31 to 38 inches; grayish brown (2.5Y 5/2) silty clay loam; many fine prominent yellowish brown (10YR 5/6) and common fine prominent strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; firm; thin nearly continuous clay films on faces of peds; few fine concretions (oxides); few dark reddish brown (5YR 2/2) stains on faces of peds; medium acid; gradual smooth boundary.

Bt4—38 to 44 inches; grayish brown (2.5Y 5/2) silty clay loam; many fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; very thin patchy clay films on vertical faces of peds; common fine dark concretions (oxides); very dark gray stains on vertical faces of many peds and in pores; medium acid; clear smooth boundary.

Bt5—44 to 53 inches; light brownish gray (2.5Y 6/2) silty clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; friable; very thin patchy clay films on faces of prisms; common fine dark concretions (oxides); very dark gray (10YR 3/1) stains in pores and on vertical faces of a few peds; medium acid; gradual smooth boundary.

BC—53 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; many fine prominent yellowish brown (10YR 5/6 and 5/8) and few medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; friable; common fine dark concretions (oxides); very dark gray (10YR 3/1) stains in pores and on vertical faces of a few peds; medium acid.

The thickness of the solum ranges from 60 to 80 inches. The A or Ap horizon is 6 to 10 inches thick. It has value of 3 and chroma of 1 or 2. The E horizon has value of 4 to 6 and chroma of 2. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2. It has mottles of higher or lower chroma and value. It is medium acid to very strongly acid.

Bertrand series

The Bertrand series consists of well drained, moderately permeable soils on stream terraces. These soils formed in stratified silty and loamy alluvial sediments. The native vegetation was deciduous trees. The slope ranges from 0 to 5 percent.

The Bertrand soils in this county contain less sand in the lower part than is defined as the range for the Bertrand series. This difference, however, does not alter the use or behavior of the soils.

The Bertrand soils commonly are adjacent to the Snider soils. The somewhat poorly drained Snider soils are in the less sloping areas. Their surface soil is darker and thicker than that of the Bertrand soils. Also, their B horizon is grayer.

Typical pedon of Bertrand silt loam, 0 to 2 percent slopes, in an area of cropland; 2,500 feet north and 1,100 feet east of the southwest corner of sec. 16, T. 70 N., R. 2 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; moderate very fine granular structure; friable; slightly acid; abrupt smooth boundary.

E—10 to 15 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate thin platy structure; friable; few fine dark concretions (oxides); slightly acid; clear smooth boundary.

Bt1—15 to 21 inches; dark yellowish brown (10YR 4/4) silt loam; brown (10YR 4/3) coatings on faces of peds; moderate very fine subangular blocky structure; friable; thin very patchy clay films; pale brown (10YR 6/3) silt coatings on faces of most peds when dry; few fine dark concretions (oxides); slightly acid; clear smooth boundary.

Bt2—21 to 28 inches; dark yellowish brown (10YR 4/4) silty clay loam; brown (10YR 4/3) coatings on faces of peds; moderate fine subangular blocky structure; friable; thin nearly continuous clay films; pale brown (10YR 6/3) silt coatings on faces of most peds when dry; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

Bt3—28 to 33 inches; dark yellowish brown (10YR 4/4) silty clay loam; brown (10YR 4/3) coatings on faces of peds; strong medium angular and subangular blocky structure; friable; thin continuous clay films; pale brown (10YR 6/3) silt coatings on faces of peds when dry; few fine dark concretions (oxides); strongly acid; gradual smooth boundary.

Bt4—33 to 42 inches; brown (10YR 4/3) loam; few fine faint dark yellowish brown (10YR 4/4) mottles; moderate fine subangular blocky structure; friable; thin nearly continuous clay films; pale brown (10YR 6/3) silt coatings on faces of some peds when dry; few fine dark concretions (oxides); strongly acid; gradual smooth boundary.

Bt5—42 to 52 inches; dark yellowish brown (10YR 4/4) loam; brown (10YR 4/3) coatings on peds; weak medium prismatic structure parting to moderate fine and medium subangular blocky; friable; pale brown (10YR 6/3) silt coatings on faces of some peds when dry; medium acid; gradual smooth boundary.

BC—52 to 60 inches; dark yellowish brown (10YR 4/4) sandy loam; brown (10YR 4/3) coatings on faces of some prisms; weak medium prismatic structure; friable; medium acid.

The thickness of the solum ranges from 50 to more than 60 inches. The surface layer is 4 to 10 inches thick.

The A or Ap horizon has value of 3 or 4 and chroma of 2 or 3. It generally is medium acid or slightly acid. The Bt horizon has value of 4 or 5 and chroma of 3 or 4. It is silt loam, loam, or silty clay loam. In some pedons the lower part of the Bt horizon and the BC and C horizons are loam and have strata of sandy loam or loamy sand.

Bolan series

The Bolan series consists of well drained soils on stream terraces. These soils are moderately permeable in the upper part of the solum and rapidly permeable in the lower part. They formed in loamy and sandy alluvial sediments. The native vegetation was prairie grasses. The slope ranges from 0 to 5 percent.

The Bolan soils in this county contain less organic matter in the surface layer than is defined as the range for the Bolan series. Also, they have a thicker solum and have lower value and chroma.

The Bolan soils are similar to the Dickinson soils and commonly are adjacent to the Dickinson and Elrin soils. The Dickinson soils contain less clay and more sand in the upper part of the solum than the Bolan soils. They are in positions on the landscape similar to those of the Bolan soils. The Elrin soils are somewhat poorly drained and are on the more nearly level stream terraces. Their B horizon is grayer than that of the Bolan soils.

Typical pedon of Bolan loam, 0 to 2 percent slopes, in an area of cropland; 2,250 feet east and 130 feet south of the northwest corner of sec. 30, T. 71 N., R. 1 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak very fine granular structure; friable; neutral; abrupt smooth boundary.

A—9 to 19 inches; dark brown (10YR 3/3) loam; very dark grayish brown (10YR 3/2) coatings on faces of peds; moderate very fine granular structure; friable; neutral; clear smooth boundary.

BA—19 to 22 inches; brown (10YR 4/3) loam; very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine faint dark yellowish brown (10YR 4/4) mottles; moderate very fine subangular blocky structure; friable; neutral; clear smooth boundary.

Bw1—22 to 27 inches; brown (10YR 4/3) loam; dark brown (10YR 3/3) coatings on faces of peds; few fine faint dark yellowish brown (10YR 4/4) mottles; moderate very fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bw2—27 to 36 inches; brown (7.5YR 4/4) fine sandy loam; brown (10YR 4/3) coatings on faces of peds; few fine faint yellowish brown (10YR 5/4) mottles; moderate very fine subangular blocky structure; friable; medium acid; clear smooth boundary.

BC1—36 to 42 inches; brown (7.5YR 4/4) loamy fine sand; weak fine subangular blocky structure; very friable; medium acid; clear smooth boundary.

2BC2—42 to 50 inches; dark yellowish brown (10YR 4/4) loamy fine sand; weak very fine subangular blocky structure; very friable; medium acid; abrupt smooth boundary.

2C1—50 to 56 inches; brown (10YR 4/3) loamy fine sand; dark brown (10YR 3/3) coatings on faces of some peds in the upper 2 inches; common fine distinct yellowish brown (10YR 5/6) mottles; single grained; loose; medium acid; abrupt smooth boundary.

2C2—56 to 60 inches; yellowish brown (10YR 5/4) loamy fine sand; common fine faint yellowish brown (10YR 5/6) mottles; single grained; loose; medium acid.

The thickness of the solum ranges from 40 to 55 inches. The thickness of the mollic epipedon ranges from 12 to 20 inches.

The A horizon has value and chroma of 2 or 3. It is dominantly loam, but the range includes silt loam that has a high content of very fine sand or fine sand. The B horizon is neutral to medium acid. The Bw horizon has

value of 3 to 5 and chroma of 3 or 4. The C horizon has value of 4 to 6 and chroma of 3 to 6.

Cantril series

The Cantril series consists of somewhat poorly drained, moderately permeable soils on foot slopes, alluvial fans, and stream terraces. These soils formed in loamy local alluvium. The native vegetation was mixed prairie grasses and deciduous trees. The slope ranges from 2 to 5 percent.

The Cantril soils commonly are adjacent to the Klum and Nodaway soils on the slightly lower parts of the flood plains. The Klum and Nodaway soils do not have a B horizon and are stratified in the C horizon.

Typical pedon of Cantril loam, 2 to 5 percent slopes, in an area of woodland; 1,100 feet west and 1,020 feet south of the northeast corner of sec. 17, T. 71 N., R. 2 W.

A—0 to 7 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; slightly acid; clear smooth boundary.

E—7 to 12 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; many fine faint brown (10YR 5/3) mottles; weak medium platy structure parting to moderate fine subangular blocky; friable; medium acid; clear smooth boundary.

BE—12 to 17 inches; brown (10YR 5/3) and grayish brown (10YR 5/2) loam; common fine faint yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; friable; pale brown (10YR 6/3) silt coatings on faces of peds when dry; strongly acid; gradual smooth boundary.

Bt1—17 to 24 inches; grayish brown (10YR 5/2) and brown (10YR 5/3) loam; common fine faint yellowish brown (10YR 5/4) mottles; moderate fine and medium subangular blocky structure; friable; very thin patchy clay films; pale brown (10YR 6/3) silt coatings on faces of many peds when dry; few fine dark concretions (oxides); strongly acid; gradual smooth boundary.

Bt2—24 to 35 inches; grayish brown (10YR 5/2) and brown (10YR 5/3) clay loam; common fine faint yellowish brown (10YR 5/4) mottles; moderate fine and medium subangular blocky structure; friable; very thin nearly continuous clay films; pale brown (10YR 6/3) silt coatings on faces of a few peds; few fine dark oxides; strongly acid; gradual smooth boundary.

Bt3—35 to 41 inches; grayish brown (10YR 5/2) and brown (10YR 5/3) clay loam; common fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; very thin nearly continuous clay films; few fine dark oxides; strongly acid; gradual smooth boundary.

BC—41 to 56 inches; grayish brown (10YR 5/2) and brown (10YR 5/3) clay loam; common fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; friable; very thin patchy clay films; few fine dark oxides; strongly acid; gradual smooth boundary.

C—56 to 60 inches; mottled dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4 and 5/6) loam; massive; friable; few pebbles; medium acid.

The thickness of the solum ranges from 45 to about 60 inches. The surface layer is 6 to 10 inches thick.

The A or Ap horizon has value of 3 and chroma of 1 or 2. It is loam or silt loam that has a high content of fine sand. It is neutral to medium acid. The E horizon has value of 4 or 5 and chroma of 2. It is loam or silt loam that has a high content of sand. The Bt horizon is strongly acid to slightly acid.

Clarinda series

The Clarinda series consists of poorly drained, very slowly permeable soils. These soils are on short, convex side slopes and in coves at the upper end of drainageways in the uplands. They formed in loess and the underlying clayey weathered glacial till. The native vegetation was prairie grasses. The slope ranges from 5 to 9 percent.

The Clarinda soils are similar to the Rinda soils and commonly are adjacent to the Nira and Otley soils. The Nira and Otley soils contain more silt and less clay than the Clarinda soils. Also, their Bt horizon has a higher chroma. The Otley soils are on the narrow tops and upper sides of ridges, and the Nira soils are on side slopes. The Rinda soils do not have a mollic epipedon. They are in positions on the landscape similar to those of the Clarinda soils.

Typical pedon of Clarinda silty clay loam, 5 to 9 percent slopes, in an area of pasture; 2,510 feet west and 650 feet north of the southeast corner of sec. 15, T. 70 N., R. 4 W.

Ap—0 to 7 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate very fine granular structure; friable; medium acid; abrupt smooth boundary.

A—7 to 13 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; very dark brown (10YR 2/2) coatings on faces of peds; few fine prominent yellowish brown (10YR 5/4) mottles; moderate very fine granular structure; medium acid; clear smooth boundary.

AB—13 to 18 inches; very dark grayish brown (10YR 3/2) silty clay loam; few fine prominent yellowish brown (10YR 5/4) mottles; moderate very fine granular structure; friable; medium acid; abrupt smooth boundary.

2Btg1—18 to 23 inches; dark gray (10YR 4/1) silty clay loam; very dark gray (10YR 3/1) coatings on faces of some peds; few fine faint dark yellowish brown (10YR 4/4) mottles; strong fine subangular and angular blocky structure; firm; very thin nearly continuous clay films; medium acid; clear smooth boundary.

2Btg2—23 to 30 inches; dark gray (10YR 4/1) silty clay; few fine and medium prominent yellowish brown (10YR 5/4) mottles; strong fine angular and subangular blocky structure; firm; very thin nearly continuous clay films; few dark carbon flecks; medium acid; clear smooth boundary.

2Btg3—30 to 37 inches; dark gray (10YR 4/1) clay; few fine prominent yellowish brown (10YR 5/6) mottles; strong fine and medium angular blocky structure; firm; very thin nearly continuous clay films; few dark carbon flecks; slightly acid; clear smooth boundary.

2Btg4—37 to 44 inches; dark gray (10YR 4/1) clay; few fine prominent yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; firm; very thin nearly continuous clay films; few fine dark concretions (oxides); neutral; clear smooth boundary.

2Btg5—44 to 60 inches; dark gray (10YR 4/1) clay; very dark gray (10YR 3/1) coatings on vertical faces of some peds; many fine prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; few fine dark concretions (oxides); neutral.

The thickness of the solum ranges from 48 to more than 60 inches. The A horizon typically formed in loess or silty sediments 12 to 18 inches thick. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is silty clay loam or silt loam. It is medium acid or slightly acid, unless it is limed. The 2Btg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1. It is silty clay loam or silty clay in the upper part and silty clay or clay in the lower part. It is strongly acid to neutral.

Clinton series

The Clinton series consists of moderately well drained, moderately slowly permeable soils on the convex tops and upper sides of ridges in the uplands and on stream benches. These soils formed in loess. The native vegetation was deciduous trees. The slope ranges from 2 to 14 percent.

The Clinton soils are similar to the Ladoga and Weller soils and commonly are adjacent to the Keomah, Inton, and Lindley soils. The Inton soils are more gray in the lower part of the B horizon than the Clinton soils. The Keomah soils are on the more nearly level parts of the landscape and are somewhat poorly drained. Their B horizon is grayer than that of the Clinton soils. The A or Ap horizon of the Ladoga soils is thicker or darker colored than that of the Clinton soils. The Lindley soils contain more sand and less silt throughout the solum than the Clinton soils. They are on the lower side slopes. The Weller soils contain more clay in the B horizon than the Clinton soils. The Inton, Ladoga, and Weller soils are on ridgetops and side slopes.

Typical pedon of Clinton silt loam, 2 to 5 percent slopes, in an area of alfalfa; 2,046 feet west and 72 feet north of the southeast corner of sec. 19, T. 69 N., R. 3 W.

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.

E—8 to 12 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; dark grayish brown (10YR 4/2) and brown (10YR 5/3) coatings on faces of some peds; very pale brown (10YR 7/3) silt coatings on faces of peds when dry; moderate medium platy structure; very friable; strongly acid; clear smooth boundary.

BE—12 to 16 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; friable; very pale brown (10YR 7/3) silt coatings on faces of some peds when dry; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

Bt1—16 to 23 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine faint brown (7.5YR 4/4) mottles; moderate fine subangular and angular blocky structure; firm; very thin patchy clay films; very pale brown (10YR 7/3) silt coatings on faces of some peds when dry; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

Bt2—23 to 32 inches; dark yellowish brown (10YR 4/4) silty clay loam; coarse fine subangular and angular blocky structure; firm; light gray (10YR 7/2) silt coatings on faces of some peds when dry; very thin nearly continuous clay films; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

Bt3—32 to 39 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine faint brown (7.5YR 4/4) mottles; some brown (10YR 5/3) coatings on faces of peds; strong fine and medium subangular and angular blocky structure; firm; light gray (10YR 7/2) silt coatings on faces of some peds when dry; very thin nearly continuous clay films; strongly acid; clear smooth boundary.

BC—39 to 46 inches; dark yellowish brown (10YR 4/4) silty clay loam; many fine faint grayish brown (10YR 5/2) and brown (10YR 5/3) and common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure; friable; light brownish gray (10YR 6/2) coatings on faces of peds when dry; common fine dark concretions (oxides); medium acid; clear smooth boundary.

C—46 to 60 inches; dark yellowish brown (10YR 4/4), grayish brown (10YR 5/2), and brown (10YR 5/3) silty clay loam; few fine faint dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; massive; friable; medium acid.

The thickness of the solum ranges from 40 to more than 60 inches. The surface layer is 0 to 8 inches thick.

The Ap horizon has value of 3 or 4 and chroma of 1 to 4. It is neutral to medium acid. The E horizon has value of 4 or 5 and chroma of 2 or 3. The Bt and BC horizons have value of 4 or 5 and chroma of 3 or 4. They typically are strongly acid or medium acid. The C horizon commonly has value of 4 or 5 and chroma of 2 to 4.

Coland series

The Coland series consists of poorly drained, moderately permeable soils on flood plains. These soils formed in loamy alluvium. The native vegetation was prairie grasses. The slope ranges from 0 to 2 percent.

The Coland soils in this county contain less organic matter in the surface layer than is defined as the range for the Coland series. Also, the lower part of their A horizon is more olive colored.

The Coland soils are similar to the Colo soils and commonly are adjacent to the Zook soils in similar positions on the landscape. The Colo soils contain less sand than the Coland soils. The Zook soils contain more clay and less sand throughout the solum than the Coland soils.

Typical pedon of Coland clay loam, 0 to 2 percent slopes, in an area of cropland; 900 feet east and 250 feet north of the southwest corner of sec. 9, T. 72 N., R. 1 W.

Ap—0 to 6 inches; black (10YR 2/1) clay loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; firm; medium acid; abrupt smooth boundary.

A1—6 to 22 inches; black (N 2/0) clay loam, black (10YR 2/1) dry; moderate fine subangular blocky structure; firm; slightly acid; gradual smooth boundary.

A2—22 to 35 inches; black (5Y 2/1) clay loam, very dark gray (10YR 3/1) dry; moderate fine subangular blocky structure; firm; neutral; clear smooth boundary.

Bg1—35 to 42 inches; very dark gray (5Y 3/1) clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; firm; neutral; clear smooth boundary.

Bg2—42 to 48 inches; dark gray (5Y 4/1) clay loam; common fine prominent dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; moderate and weak fine subangular blocky structure; firm; neutral; clear smooth boundary.

Cg—48 to 60 inches; dark gray (5Y 4/1) clay loam; many fine prominent strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; firm; neutral.

The thickness of the solum ranges from 36 to more than 48 inches. The mollic epipedon is more than 36 inches thick.

The A horizon has value of 2 or 3 and chroma of 1 or less. It is dominantly clay loam but in many pedons is silty clay loam that has a high content of sand. It is neutral to medium acid. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 or 4, and chroma of 1 or less. It is clay loam or silty clay loam. It is slightly acid or neutral. The Cg horizon has hue of 10YR, 2.5Y, or 5Y and value of 2 to 5. It is clay loam, loam, or sandy loam.

Colo series

The Colo series consists of poorly drained, moderately permeable soils on flood plains and alluvial fans and along the upland drainageways. These soils formed in silty alluvium. The native vegetation was prairie grasses. The slope ranges from 0 to 5 percent.

The Colo soils are similar to the Coland soils and commonly are adjacent to the Nodaway soils. The Coland soils contain more sand than the Colo soils. The Nodaway soils are lighter colored than the Colo soils and contain less clay. They are stratified and are near stream channels.

Typical pedon of Colo silty clay loam, 0 to 2 percent slopes, in an area of cropland; 1,320 feet south and 25 feet east of the northwest corner of sec. 19, T. 72 N., R. 4 W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; mixed with some very dark gray (10YR 3/1) material; moderate very fine granular structure; friable; neutral; abrupt smooth boundary.

A1—10 to 17 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate very fine subangular blocky structure; friable; few fine dark concretions (oxides); neutral; gradual smooth boundary.

A2—17 to 26 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; moderate fine and very fine subangular blocky structure; firm; neutral; gradual smooth boundary.

A3—26 to 38 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate coarse subangular blocky structure parting to strong fine subangular blocky; firm; neutral; gradual smooth boundary.

Bw—38 to 47 inches; black (10YR 2/1) silty clay loam; few medium faint olive gray (5Y 5/2) and few fine prominent yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to weak fine and medium subangular blocky; firm; few fine dark concretions (oxides); neutral; gradual smooth boundary.

Cg—47 to 60 inches; olive gray (5Y 5/2) silty clay loam, very dark gray (10YR 3/1) kneaded; massive; firm; common fine distinct brown (7.5YR 5/4) mottles; few fine dark concretions (oxides); neutral.

The thickness of the solum ranges from 36 to 54 inches. The mollic epipedon is 36 inches or more thick.

The A horizon has value of 2 or 3 and chroma of 0 or 1. It is neutral or slightly acid. The Bw horizon has value of 2 or 3 and chroma of 0 or 1. The Cg horizon has value of 2 to 5 and chroma of 1 or 2. It is neutral or slightly acid. Silty clay or sandy or gravelly horizons are below a depth of 48 inches in some pedons.

Coppock series

The Coppock series consists of somewhat poorly drained or poorly drained, moderately permeable soils on low stream terraces and foot slopes. These soils formed in silty alluvium. The native vegetation was mixed prairie grasses and deciduous trees. The slope ranges from 0 to 2 percent.

The Coppock soils are similar to the Vesser soils and commonly are adjacent to the Bertrand soils. The Bertrand soils do not have a mollic epipedon. They contain less clay than the Coppock soils and have higher chroma in the B horizon. They are well drained and are on low stream terraces. The Vesser soils are in positions on the landscape similar to those of the Coppock soils. Their mollic epipedon is thicker than that of the Coppock soils.

Typical pedon of Coppock silt loam, 0 to 2 percent slopes, in an area of cropland; 550 feet west and 2,175 feet north of the southeast corner of sec. 20, T. 70 N., R. 2 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; mixed with some streaks and patches of dark grayish brown (10YR 4/2) subsurface material; few fine faint dark yellowish brown (10YR 4/4) mottles; weak very fine granular structure; friable; few fine dark concretions (oxides); neutral; abrupt smooth boundary.

E1—8 to 14 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; very dark grayish brown (10YR 3/2) coatings on plates; few fine prominent strong brown (7.5YR 5/6) mottles; moderate medium platy structure parting to moderate very fine subangular blocky; friable; few fine dark concretions (oxides); neutral; clear smooth boundary.

E2—14 to 19 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; common fine prominent strong brown (7.5YR 5/6) mottles; moderate medium platy structure parting to moderate very fine subangular blocky; friable; few fine dark concretions (oxides); medium acid; abrupt smooth boundary.

E3—19 to 25 inches; grayish brown (2.5Y 5/2) silt loam; dark grayish brown (10YR 4/2) coatings on faces of some peds; light gray (10YR 7/2) sand and silt coatings on peds when dry; many fine prominent yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; very thin patchy clay films; few fine dark concretions (oxides); medium acid; clear smooth boundary.

Btg1—25 to 32 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of peds; light gray (10YR 7/2) sand and silt coatings on peds when dry; moderate fine subangular and angular blocky structure; firm; thin nearly continuous clay films; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

Btg2—32 to 41 inches; grayish brown (2.5Y 5/2) silty clay loam; dark grayish brown (10YR 4/2) coatings on vertical faces of some peds; light gray (10YR 7/2) sand and silt coatings on some peds when dry; many fine prominent yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; very thin nearly continuous clay films; few fine dark oxides; strongly acid; clear smooth boundary.

Btg3—41 to 52 inches; grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) silty clay loam; few fine prominent dark brown (7.5YR 3/2) mottles; dark grayish brown (10YR 4/2) coatings on faces of some peds; weak medium prismatic structure parting to moderate fine subangular blocky; friable; thin patchy clay films; few fine dark oxides; medium acid; gradual smooth boundary.

BCg—52 to 60 inches; dark grayish brown (2.5Y 4/2) and yellowish brown (10YR 5/6) silty clay loam; few fine prominent dark brown (7.5YR 3/2) mottles; moderate medium prismatic structure; friable; few fine dark concretions (oxides); few dark stains in old root channels; medium acid.

The thickness of the solum ranges from 45 to more than 60 inches. The mollic colors extend to a depth of 6 to 10 inches.

The A or Ap horizon has value of 3 and chroma of 1 or 2. It is medium acid to neutral. The E horizon has value of 4 to 6 and chroma of 1 or 2. It is strongly acid to neutral. The Btg horizon has value of 4 or 5 and chroma of 1 to 4 and has mottles of higher value and chroma. It is strongly acid or medium acid.

Dickinson series

The Dickinson series consists of well drained or somewhat excessively drained soils on stream terraces. Permeability is moderately rapid in the upper part of the solum and rapid in the lower part. These soils formed in loamy and sandy alluvium that has been partially reworked by the wind. The native vegetation was prairie grasses. The slope ranges from 0 to 5 percent.

The Dickinson soils are similar to the Bolan and Hoopeston soils and commonly are adjacent to those soils. The Bolan soils are in positions on the landscape similar to those of the Dickinson soils. They contain more clay in the A horizon and the upper part of the B horizon than the Dickinson soils. The Hoopeston soils are somewhat poorly drained. They are in the more nearly level areas on stream terraces. Their B horizon is grayer than that of the Dickinson soils.

Typical pedon of Dickinson fine sandy loam, 2 to 5 percent slopes, in an area of cropland; 1,770 feet north and 85 feet east of the southwest corner of sec. 9, T. 72 N., R. 1 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; mixed with some streaks and patches of dark brown (10YR 3/3) subsurface material; weak very fine granular structure; very friable; medium acid; abrupt smooth boundary.

AB—7 to 16 inches; very dark grayish brown (10YR 3/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; mixed with some dark brown (10YR 3/3) material; moderate very fine granular structure; very friable; medium acid; clear smooth boundary.

BA—16 to 20 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 4/3) dry; very dark grayish brown (10YR 3/2) coatings on faces of peds; moderate very fine subangular blocky structure; very friable; slightly acid; clear smooth boundary.

Bw1—20 to 29 inches; dark yellowish brown (10YR 4/4) fine sandy loam; dark brown (10YR 3/3) coatings on faces of peds; moderate very fine subangular blocky structure; very friable; medium acid; clear smooth boundary.

Bw2—29 to 33 inches; dark yellowish brown (10YR 4/4) fine sandy loam; brown (10YR 4/3) coatings on faces of some peds; moderate very fine subangular blocky structure; very friable; medium acid; clear smooth boundary.

BC—33 to 47 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium prismatic structure parting to weak fine subangular blocky; very friable; medium acid; abrupt smooth boundary.

C—47 to 60 inches; dark yellowish brown (10YR 4/4) sand; single grained; loose; medium acid.

The thickness of the solum ranges from 36 to 50 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is neutral to medium acid. It is dominantly fine sandy loam, but the range includes sandy loam. The Bw horizon has value of 3 to 5 and chroma of 2 to 6. It is dominantly fine sandy loam, but in some pedons the lower part is sandy loam, loamy fine sand, loamy sand, fine sand, or sand. The C horizon has value of 4 or 5 and chroma of 3 to 6. It is dominantly sand, but the range includes loamy fine sand, loamy sand, and fine sand.

Dolbee series

The Dolbee series consists of poorly drained, moderately permeable soils on flood plains. These soils formed in silty and loamy alluvium. The native vegetation was prairie grasses. The slope ranges from 0 to 2 percent.

The Dolbee soils are commonly adjacent to the Titus and Zook soils at the slightly lower elevations. The Titus soils contain more clay throughout than the Dolbee soils. The Zook soils contain more clay in the B horizon than the Dolbee soils. Also, their mollic epipedon is thicker and darker.

Typical pedon of Dolbee silt loam, 0 to 2 percent slopes, in an area of cropland; 860 feet east and 150 feet south of the northwest corner of sec. 18, T. 72 N., R. 1 W.

Ap—0 to 8 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A1—8 to 13 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; few fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine granular structure; friable; few fine dark concretions (oxides); neutral; clear smooth boundary.

A2—13 to 18 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; black (10YR 2/1) coatings on faces of peds; few fine faint dark grayish brown (10YR 4/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine granular structure; friable; few fine dark concretions (oxides); neutral; gradual smooth boundary.

BA—18 to 23 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; black (10YR 2/1) coatings on faces of peds; few fine faint dark grayish brown (10YR 4/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine subangular blocky structure; friable; few fine dark concretions (oxides); neutral; clear smooth boundary.

Bg1—23 to 29 inches; dark gray (5Y 4/1) silty clay loam; very dark gray (10YR 3/1) coatings on faces of peds; common fine distinct yellowish brown (10YR 5/6) and few fine distinct strong brown (7.5YR 5/8) mottles; moderate very fine subangular blocky structure; friable; few fine dark concretions (oxides); neutral; gradual smooth boundary.

Bg2—29 to 39 inches; dark gray (5Y 4/1) silty clay loam; very dark gray (10YR 3/1) coatings on faces of peds and in root channels; common fine distinct brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; moderate fine and very fine subangular blocky structure; friable; neutral; gradual smooth boundary.

Bg3—39 to 45 inches; dark gray (5Y 4/1) silty clay loam; very dark gray (10YR 3/1) coatings on faces of some peds and in root channels; common fine distinct brown (7.5YR 4/4) and strong brown (7.5YR 5/6) and few fine faint dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky structure; friable; few fine dark oxides; neutral; clear smooth boundary.

Bg4—45 to 56 inches; dark gray (5Y 4/1) silty clay loam; very dark gray (10YR 3/1) coatings on faces of some peds and in root channels; common fine distinct brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; friable; neutral; gradual smooth boundary.

BCg—56 to 60 inches; dark gray (5Y 4/1) silty clay loam; very dark gray (10YR 3/1) coatings on faces of some prisms; few fine distinct brown (7.5YR 4/4) mottles; moderate medium prismatic structure; friable; neutral.

The thickness of the solum is more than 40 inches. The thickness of the mollic epipedon ranges from 16 to 24 inches.

The A horizon has value of 2 or 3 and chroma of 1. It is neutral or slightly acid. It generally is silt loam, but the range includes silty clay loam. The Bg and BC horizons have hue of 5Y, value of 4 or 5, and chroma of 1. They are silty clay loam or silt loam. They are neutral or slightly acid.

Dorchester series

The Dorchester series consists of well drained or moderately well drained, moderately permeable soils on bottom land. These soils formed in recent, calcareous stratified alluvium. The slope ranges from 0 to 2 percent.

The Dorchester soils are similar to the Nodaway soils and are commonly adjacent to the Klum and Nodaway soils, generally along the smaller rivers. The Klum soils contain more sand and less clay than the Dorchester soils. The Nodaway and Klum soils are not calcareous.

Typical pedon of Dorchester silt loam, 0 to 2 percent slopes, in an area of cropland; 1,900 feet south and 725 feet east of the northwest corner of sec. 15, T. 70 N., R. 2 W.

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

C1—8 to 14 inches; dark brown (10YR 3/3) silt loam, light brownish gray (10YR 6/2) dry; few fine faint dark grayish brown (10YR 4/2) mottles; massive; horizontal cleavage planes; friable; slight effervescence; mildly alkaline; clear wavy boundary.

C2—14 to 19 inches; stratified dark brown (10YR 3/3) and brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; few fine faint dark grayish brown (10YR 4/2) mottles; massive; horizontal cleavage planes; friable; slight effervescence; mildly alkaline; clear wavy boundary.

C3—19 to 28 inches; stratified dark brown (10YR 3/3) and brown (10YR 4/3) silt loam; few very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine prominent reddish brown (5YR 4/4) and few fine distinct yellowish brown (10YR 5/4) mottles; massive; horizontal cleavage planes; friable; slight effervescence; mildly alkaline; clear wavy boundary.

C4—28 to 34 inches; dark grayish brown (10YR 4/2) silt loam; massive; horizontal cleavage planes; friable; slight effervescence; mildly alkaline; clear wavy boundary.

C5—34 to 40 inches; very dark grayish brown (10YR 3/2) silt loam; few fine faint reddish brown (5YR 4/4) mottles; dark reddish brown (5YR 3/3) coatings on a few plates and peds; massive; horizontal cleavage planes; friable; slight effervescence; mildly alkaline; clear wavy boundary.

C6—40 to 49 inches; stratified very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2), and grayish brown (10YR 5/2) silt loam; few fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; several thin strata of fine sandy loam and loamy fine sand; massive; horizontal cleavage planes; friable; slight effervescence; mildly alkaline; clear wavy boundary.

C7—49 to 60 inches; stratified dark grayish brown (10YR 4/2), very dark grayish brown (10YR 3/2), and grayish brown (10YR 5/2) silty clay loam; common fine prominent dark reddish brown (5YR 3/4) mottles; massive; horizontal cleavage planes; friable; few fine dark oxides; slight effervescence; mildly alkaline.

The solum is 6 to 10 inches thick. The A horizon has value and chroma of 3 or 4. It is neutral or mildly alkaline. The C horizon is stratified. It has value of 3 to 5 and chroma of 1 to 3. It is effervescent. It generally is mildly alkaline, but the range includes neutral.

Douds series

The Douds series consists of moderately well drained, moderately permeable soils on ridgetops and side slopes on upland benches that border the valleys of major streams and their tributaries. These soils formed in mixed alluvium of pre-Sangamon age. The native vegetation was deciduous trees. The slope ranges from 14 to 18 percent.

The Douds soils are similar to the Lindley soils and commonly are adjacent to the Clinton and Lindley soils. The Clinton soils contain less sand throughout than the Douds soils. They formed in loess. They are on the ridgetops and the upper side slopes. The lower part of the solum in the Lindley soils contains less sand than that of the Douds soils.

Typical pedon of Douds loam, 14 to 18 percent slopes, in a timbered area; 450 feet south and 725 feet east of the center of sec. 4, T. 70 N., R. 3 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) loam, pale brown (10YR 6/3) dry; weak very fine granular structure; friable; slightly acid; clear smooth boundary.

E—3 to 8 inches; brown (10YR 5/3) loam, very pale brown (10YR 7/3) dry; dark brown (10YR 3/3) coatings on faces of some plates; few fine distinct yellowish brown (10YR 5/6) mottles; moderate thin platy structure; friable; medium acid; clear smooth boundary.

Bt1—8 to 19 inches; dark yellowish brown (10YR 4/4) loam; few fine and medium prominent strong brown (7.5YR 5/6) mottles; moderate very fine subangular and angular blocky structure; friable; few very thin patchy clay films; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

Bt2—19 to 32 inches; dark yellowish brown (10YR 4/4) loam; few fine faint grayish brown (10YR 5/2) and common fine and medium faint brown (7.5YR 4/4) mottles; moderate very fine subangular blocky structure; friable; very thin nearly continuous clay films; strongly acid; clear smooth boundary.

Bt3—32 to 38 inches; brown (10YR 4/3) loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; friable; very thin nearly continuous clay films; clay flows on vertical faces of some peds; clean sand grains on vertical faces of some peds; strongly acid; abrupt smooth boundary.

BC1—38 to 50 inches; dark grayish brown (10YR 4/2) sandy clay loam; many fine prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; friable; medium acid; gradual smooth boundary.

BC2—50 to 60 inches; brown (10YR 4/3) sandy clay loam; many fine prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; friable; medium acid.

The thickness of the solum ranges from 45 to 72 inches. The surface layer is 2 to 5 inches thick.

The A horizon has value of 3 to 5 and chroma of 1 to 3. It is dominantly loam, but the range includes silt loam. The Bt horizon has value of 4 or 5 and chroma of 3 to 8. It is medium acid to very strongly acid. It is dominantly loam, but the range includes clay loam and sandy clay loam.

Elrin series

The Elrin series consists of somewhat poorly drained soils on stream terraces. These soils are moderately permeable in the upper part of the solum and rapidly permeable in the lower part. They formed in loamy and sandy alluvium. The native vegetation was prairie grasses. The slope ranges from 0 to 2 percent.

The Elrin soils are similar to the Hoopeston soils and commonly are adjacent to the Bolan, Dickinson, and Hoopeston soils. The well drained Bolan and well drained or somewhat excessively drained Dickinson soils are in the more sloping areas on stream terraces. They have higher chroma in the B horizon than the Elrin soils. The Dickinson and Hoopeston soils contain less clay in the upper part of the solum than the Elrin soils. The Hoopeston soils are in positions on the landscape similar to those of the Elrin soils.

Typical pedon of Elrin loam, 0 to 2 percent slopes, in a cultivated field; 2,050 feet south and 370 feet east of the northwest corner of sec. 32, T. 72 N., R. 1 W.

Ap—0 to 5 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; weak very fine granular structure; friable; neutral; abrupt smooth boundary.
A1—5 to 10 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; common fine distinct brown (7.5YR 4/4) mottles; weak very fine granular structure; friable; neutral; clear smooth boundary.
A2—10 to 16 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; very dark brown (10YR 2/2) coatings on faces of some peds; weak very fine granular structure; friable; medium acid; clear smooth boundary.
AB—16 to 20 inches; dark brown (10YR 3/3) loam, dark grayish brown (10YR 4/2) dry; very dark grayish brown (10YR 3/2) coatings on faces of peds; moderate very fine subangular blocky structure; friable; strongly acid; clear smooth boundary.
BA—20 to 27 inches; dark grayish brown (10YR 4/2) loam; common fine prominent brown (7.5YR 4/4) mottles; moderate very fine subangular blocky structure; friable; strongly acid; gradual smooth boundary.
Bw1—27 to 33 inches; dark grayish brown (10YR 4/2) sandy loam; many fine prominent brown (7.5YR 4/4) and few fine prominent dark reddish brown (5YR 3/2) mottles; moderate very fine subangular blocky structure; friable; medium acid; gradual smooth boundary.
Bw2—33 to 41 inches; mottled dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4) sandy loam; weak fine subangular blocky structure; very friable; medium acid; clear smooth boundary.
BC1—41 to 51 inches; mottled dark yellowish brown (10YR 4/4) and brown (10YR 4/3) loamy sand; weak medium prismatic structure; very friable; medium acid; clear smooth boundary.
BC2—51 to 60 inches; brown (10YR 4/3) loamy sand; band of mottled dark grayish brown (10YR 4/2) and brown (7.5YR 4/4) sandy loam at a depth of 54 to 57 inches; weak medium prismatic structure; very friable; medium acid.

The thickness of the solum ranges from 45 to more than 60 inches. The thickness of the mollic epipedon ranges from 12 to 24 inches.

The A horizon has value and chroma of 2 or 3. It generally is loam, but the range includes silt loam that has a high content of very fine sand or fine sand. The Bw horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 and in many pedons has higher chroma mottles. It is slightly acid to strongly acid. The C horizon, if it occurs, has value of 4 or 5 and chroma of 2 to 6. It is sandy loam, loamy sand, or sand and may be stratified.

Fayette series

The Fayette series consists of well drained, moderately permeable soils on ridgetops and side slopes. These soils formed in loess. The native vegetation was deciduous trees. The slope ranges from 2 to 14 percent.

The Fayette soils are similar to the Inton soils and commonly are adjacent to the Lindley soils. The B horizon of the Inton soils is grayer than that of the Fayette soils. The Lindley soils contain more sand throughout than the Fayette soils. They are downslope from the Fayette soils.

Typical pedon of Fayette silt loam, 5 to 9 percent slopes, in a timbered area; 750 feet south and 1,000 feet west of the northeast corner of sec. 11, T. 72 N., R. 2 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; neutral; clear smooth boundary.
E1—3 to 5 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium platy structure parting to moderate very fine subangular blocky; friable; neutral; clear smooth boundary.
E2—5 to 11 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; very dark grayish brown (10YR 3/2) coatings on faces of some plates; moderate thin platy structure; friable; few fine dark oxides; slightly acid; abrupt smooth boundary.
BE—11 to 14 inches; brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; moderate very fine subangular blocky structure; friable; few fine dark oxides; medium acid; clear smooth boundary.
Bt1—14 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; dark yellowish brown (10YR 4/4) coatings on faces of peds; moderate fine angular and subangular blocky structure; friable; very thin patchy clay films; light brownish gray (10YR 6/2) silt coatings on faces of peds when dry; few fine dark concretions (oxides); strongly acid; clear smooth boundary.
Bt2—20 to 30 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine angular and subangular blocky structure; friable; very thin nearly continuous clay films on peds; light brownish gray (10YR 6/2) silt coatings on faces of peds when dry; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

Bt3—30 to 38 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine angular and subangular blocky structure; friable; light brownish gray (10YR 6/2) silt coatings on faces of peds when dry; thin nearly continuous clay films; common fine dark concretions (oxides); strongly acid; gradual smooth boundary.

Bt4—38 to 47 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; thin nearly continuous clay films; light brownish gray (10YR 6/2) silt coatings on faces of peds when dry; common fine dark concretions (oxides); medium acid; gradual smooth boundary.

Bt5—47 to 56 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; friable; very thin patchy clay films; light brownish gray (10YR 6/2) silt coatings on faces of some peds when dry; common fine dark concretions (oxides); medium acid; gradual smooth boundary.

BC—56 to 60 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium prismatic structure; friable; light brownish gray (10YR 6/2) silt coatings on faces of some peds when dry; common fine dark concretions (oxides); medium acid.

The thickness of the solum ranges from 42 to more than 60 inches. The A horizon is 1 to 4 inches thick.

The A or Ap horizon has value of 2 to 4 and chroma of 1 to 3. It is neutral to medium acid. The E horizon has value of 3 to 5 and chroma of 1 to 4. The Bt horizon has value of 4 or 5 and chroma of 3 or 4. The Bt and BC horizons are medium acid to very strongly acid.

Gara series

The Gara series consists of moderately well drained or well drained, moderately slowly permeable soils on convex ridgetops and side slopes dissected by drainageways. These soils formed in glacial till. The native vegetation was mixed prairie grasses and deciduous trees. The slope ranges from 9 to 18 percent.

The Gara soils are similar to the Lindley soils and are commonly adjacent to the Ladoga soils. The Ladoga soils are on ridgetops and side slopes. Their solum contains more clay and less sand throughout than that of the Gara soils. The Lindley soils are in positions on the landscape similar to those of the Gara soils. Their surface layer is thinner and lighter colored than that of the Gara soils.

Typical pedon of Gara loam, 14 to 18 percent slopes, in a timbered area; 792 feet west and 2,376 feet south of the northeast corner of sec. 33, T. 70 N., R. 3 W.

A1—0 to 4 inches; very dark gray (10YR 3/1) loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; medium acid; clear smooth boundary.

A2—4 to 8 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; mixed with some dark grayish brown (10YR 4/2) material; very dark gray (10YR 3/1) coatings on faces of some peds; moderate fine granular structure; friable; strongly acid; abrupt smooth boundary.

E—8 to 12 inches; dark grayish brown (10YR 4/2) loam; mixed with some brown (10YR 4/3) material; very dark grayish brown (10YR 3/2) coatings on faces of some peds; weak medium platy structure parting to moderate very fine subangular blocky; friable; strongly acid; clear smooth boundary.

Bt1—12 to 18 inches; dark yellowish brown (10YR 4/4) loam; brown (10YR 4/3) coatings on faces of some peds; moderate very fine subangular blocky structure; friable; thin patchy clay films; few pebbles and stones; strongly acid; clear smooth boundary.

Bt2—18 to 23 inches; dark yellowish brown (10YR 4/4) loam; brown (10YR 4/3) coatings on faces of some peds; moderate fine subangular and angular blocky structure; friable; thin nearly continuous clay films; few pebbles and stones; strongly acid; clear smooth boundary.

Bt3—23 to 33 inches; yellowish brown (10YR 5/4) clay loam; common fine faint yellowish brown (10YR 5/6) mottles; coarse fine and medium subangular and angular blocky structure; firm; thin patchy clay films; few fine dark concretions (oxides); few pebbles and stones; medium acid; gradual smooth boundary.

BC—33 to 47 inches; yellowish brown (10YR 5/4) clay loam; common fine faint yellowish brown (10YR 5/6) and common fine faint grayish brown (2.5Y 5/2) mottles; moderate medium prismatic structure; firm; thin patchy clay films; clay flows in root channels; many fine dark concretions (oxides); few pebbles and stones; slightly acid; clear smooth boundary.

C—47 to 60 inches; yellowish brown (10YR 5/4) clay loam; common fine and medium faint yellowish brown (10YR 5/6 and 5/8) mottles; massive; firm; few fine dark concretions (oxides); few fine calcium carbonate accumulations in threadlike streaks; few pebbles and stones; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 36 to 60 inches. The A horizon is 6 to 10 inches thick.

The A or Ap horizon has value of 3 and chroma of 1 or 2. It generally is medium acid or slightly acid unless limed. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The C horizon has value of 4 or 5 and chroma of 4 to 6.

Givin series

The Givin series consists of somewhat poorly drained, moderately slowly permeable soils on ridgetops and slopes that form the head of drainageways in the uplands. These soils formed in loess. The native vegetation was mixed prairie grasses and deciduous trees. The slope ranges from 1 to 3 percent.

The Givin soils are similar to the Keomah and Pershing soils and commonly are adjacent to the Ladoga and Rubio soils. The Keomah soils are in positions on the landscape similar to those of the Givin soils. Their A1 or Ap horizon is lighter colored than that of the Givin soils. The moderately well drained Ladoga soils are downslope from the Givin soils. Their B horizon is more brown that that of the Givin soils. The Pershing soils contain more clay in the B horizon than the Givin soils. They are in positions on the landscape similar to those of the Givin soils. The poorly drained Rubio soils are in the more nearly level downslope areas. Their B horizon is more gray than that of the Givin soils.

Typical pedon of Givin silt loam, 1 to 3 percent slopes, in a stubble field; 1,720 feet south and 900 feet west of the northeast corner of sec. 3, T. 69 N., R. 4 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; mixed with some dark grayish brown (10YR 4/2) material; weak fine and very fine granular structure; friable; neutral; abrupt smooth boundary.

E—8 to 12 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine faint brown (10YR 4/3) mottles; moderate medium platy structure; friable; strongly acid; clear smooth boundary.

Bt1—12 to 15 inches; dark grayish brown (10YR 4/2) and brown (10YR 4/3) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of peds; very dark grayish brown (10YR 3/2) coatings on faces of some peds; few fine distinct dark brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; friable; very thin patchy clay films; strongly acid; clear smooth boundary.

Bt2—15 to 22 inches; grayish brown (10YR 5/2) and brown (10YR 4/3) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of peds; few medium distinct strong brown (7.5YR 5/6) mottles; moderate very fine and fine subangular and angular blocky structure; firm; dark organic stains on faces of peds; very thin nearly continuous clay films; very pale brown (10YR 7/3) silt coatings on faces of some peds when dry; strongly acid; gradual smooth boundary.

Bt3—22 to 30 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct dark yellowish brown (10YR 4/4) and few fine distinct strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular and angular blocky structure; firm; few dark organic stains on faces of peds; very thin nearly continuous clay films; very pale brown (10YR 7/3) silt coatings on faces of some peds when dry; strongly acid; gradual smooth boundary.

Btg1—30 to 42 inches; grayish brown (2.5Y 5/2) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of peds; many medium distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium and fine subangular blocky; friable; thin nearly continuous clay films; clay flows in root channels; few fine dark concretions (oxides); medium acid; gradual smooth boundary.

BCg—42 to 48 inches; olive gray (5Y 5/2) silty clay loam; few dark grayish brown (10YR 4/2) coatings on faces of prisms; common medium distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; friable; medium acid; clear smooth boundary.

Cg—48 to 60 inches; olive gray (5Y 5/2) silty clay loam; few medium distinct strong brown (7.5YR 5/6) mottles; massive; friable; slightly acid.

The thickness of the solum ranges from 40 to 60 inches. The Ap or A1 horizon is 6 to 9 inches thick.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The E horizon has value of 4 or 5 and chroma of 2. The Bt horizon has value of 4 or 5 and chroma of 2 or 3. It has hue of 10YR in the upper part and 2.5Y in the lower part. It is silty clay loam or silty clay. The BCg and Cg horizons have hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 2.

Grundy series

The Grundy series consists of somewhat poorly drained, slowly permeable soils on ridgetops and side slopes in the uplands. These soils formed in loess. The native vegetation was prairie grasses. The slope ranges from 1 to 4 percent.

The Grundy soils are similar to the Mahaska soils and commonly are adjacent to the Haig and Pershing soils. The nearly level Haig soils are poorly drained. Their B horizon has lower chroma than that of the Grundy soils. The Mahaska soils are in the less sloping areas on upland ridgetops. Their B horizon contains less clay than that of the Grundy soils. The Pershing soils do not have a mollic epipedon. They are in positions on the landscape similar to those of the Grundy soils.

Typical pedon of Grundy silty clay loam, 1 to 4 percent slopes, in an area of cropland; 1,825 feet north and 65

feet east of the southwest corner of sec. 7, T. 70 N., R. 4 W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak very fine granular structure; friable; neutral; abrupt smooth boundary.

A—10 to 14 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; black (10YR 2/1) coatings on faces of peds; moderate very fine granular structure; friable; neutral; clear smooth boundary.

BA—14 to 18 inches; dark grayish brown (10YR 4/2) silty clay loam; very dark gray (10YR 3/1) coatings on faces of peds; few fine faint brown (10YR 5/3) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; few fine dark concretions (oxides); neutral; clear smooth boundary.

Btg1—18 to 23 inches; dark grayish brown (10YR 4/2) silty clay; few fine faint brown (10YR 5/3) and few fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; moderate fine subangular blocky structure; firm; very thin nearly continuous clay films; few fine dark concretions (oxides); slightly acid; clear smooth boundary.

Btg2—23 to 29 inches; grayish brown (2.5Y 5/2) silty clay; dark grayish brown (10YR 4/2) coatings on faces of peds; few fine faint brown (10YR 5/3) and yellowish brown (10YR 5/4) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; thin continuous clay films; very dark gray (10YR 3/1) coatings in old root channels; few fine dark concretions (oxides); black (5Y 2/2) stains on faces of some peds; medium acid; gradual smooth boundary.

Btg3—29 to 36 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) and few fine distinct yellowish brown (10YR 5/6) mottles; strong fine and medium subangular and angular blocky structure; firm; thin continuous clay films; very dark gray (10YR 3/1) coatings in old root channels; few fine dark concretions (oxides); medium acid; gradual smooth boundary.

Btg4—36 to 45 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; thin nearly continuous clay films; very dark gray (10YR 3/1) coatings in old root channels; few fine dark concretions (oxides); slightly acid; clear smooth boundary.

BCg—45 to 56 inches; olive gray (5Y 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; friable; very dark gray (10YR 3/1) coatings in old root channels; few fine dark concretions (oxides); neutral; clear smooth boundary.

Cg—56 to 60 inches; olive gray (5Y 5/2) silty clay loam; few fine prominent yellowish brown (10YR 5/6) mottles; massive; friable; neutral.

The thickness of the solum ranges from 40 to 72 inches. The thickness of the mollic epipedon ranges from 12 to 18 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is medium acid to neutral. The Btg horizon generally has hue of 10YR or 2.5Y but in some pedons has hue of 5Y in the lower part. It has value of 4 or 5 and chroma of 2 to 6. It is strongly acid to neutral.

Haig series

The Haig series consists of poorly drained, slowly permeable soils on upland ridgetops. These soils formed in loess. The native vegetation was prairie grasses. The slope ranges from 0 to 2 percent.

The Haig soils are similar to the Taintor soils and commonly are adjacent to the Grundy soils. The somewhat poorly drained Grundy soils are in the more sloping areas on ridgetops and side slopes. Their B horizon is browner than that of the Haig soils. The Taintor soils are in positions on the landscape similar to those of the Haig soils. Their B horizon contains less clay than that of the Haig soils.

Typical pedon of Haig silt loam, 0 to 2 percent slopes, in a cultivated field; 1,300 feet west and 575 feet north of the southeast corner of sec. 32, T. 70 N., R. 4 W.

Ap—0 to 8 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate very fine granular structure; friable; neutral; clear smooth boundary.

A—8 to 12 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; few fine distinct yellowish brown (10YR 5/4) mottles; moderate very fine granular structure; firm; neutral; clear smooth boundary.

AB—12 to 17 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; black (10YR 2/1) coatings on faces of peds; few fine faint dark gray (10YR 4/1) mottles; moderate very fine subangular structure; firm; very thin continuous clay films on faces of peds; few fine dark oxides; neutral; gradual smooth boundary.

Btg1—17 to 22 inches; dark gray (10YR 4/1) silty clay, dark gray (10YR 4/1) kneaded; very dark gray (10YR 3/1) coatings on faces of peds; few fine prominent yellowish brown (10YR 5/4 and 5/6) mottles; moderate very fine subangular blocky structure; firm; thin continuous clay films on faces of peds; few fine dark oxides; neutral; clear smooth boundary.

Btg2—22 to 25 inches; dark gray (10YR 4/1) silty clay; very dark gray (10YR 3/1) coatings on faces of peds; few fine prominent yellowish brown (10YR 5/4 and 5/6) mottles; moderate very fine subangular blocky structure; firm; very thin continuous clay films on faces of peds; few fine dark oxides; slightly acid; clear smooth boundary.

Btg3—25 to 31 inches; dark gray (10YR 4/1) silty clay; few fine faint grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; firm; very thin continuous clay films on faces of peds; few fine dark oxides; very dark gray (10YR 3/1) stains on faces of some peds; medium acid; clear smooth boundary.

Btg4—31 to 40 inches; dark gray (10YR 4/1) and olive gray (5Y 4/2) silty clay loam; common fine prominent yellowish brown (10YR 5/4 and 5/6) and few fine prominent strong brown (7.5YR 4/6) mottles; moderate fine subangular and angular blocky structure; firm; very thin nearly continuous clay films on faces of peds; few fine dark oxides; very dark gray (10YR 3/1) stains on vertical faces of some peds and in old root channels; slightly acid; gradual smooth boundary.

Btg5—40 to 51 inches; olive gray (5Y 5/2) silty clay loam; common fine distinct dark gray (10YR 4/1) and many fine and medium prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak medium prismatic structure parting to weak fine angular and subangular blocky; firm; very thin patchy clay films on faces of peds; few fine dark oxides; very dark gray (10YR 3/1) stains on vertical faces of peds and in old root channels; neutral; gradual smooth boundary.

BCg—51 to 60 inches; olive gray (5Y 5/2) silty clay loam; few fine prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure; friable; thin patchy clay films on faces of peds; few fine dark oxides; dark gray stains on vertical faces of peds; neutral.

The thickness of the solum ranges from 50 to 80 inches. The thickness of the mollic epipedon ranges from 12 to 18 inches.

The A horizon has value of 2 or 3 and chroma of 1. It is medium acid to neutral. The Btg horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2. If the hue is 5Y, the chroma is 2.

Hedrick series

The Hedrick series consists of moderately well drained, moderately permeable soils in coves at the head of drainageways and on short, convex to plane side slopes in the uplands. These soils formed in loess. The native vegetation was mixed prairie grasses and deciduous trees. The slope ranges from 2 to 9 percent.

The Hedrick soils are similar to the Ladoga soils and commonly are adjacent to the Givin and Ladoga soils. The somewhat poorly drained Givin soils are upslope from the Hedrick soils. They are grayer in the upper part of the B horizon than the Hedrick soils and contain more clay in the B horizon. The Ladoga soils are in positions on the landscape similar to those of the Hedrick soils. Their B horizon is brown at a greater depth than that of the Hedrick soils and contains more clay.

Typical pedon of Hedrick silt loam, 2 to 5 percent slopes, in a pastured area; 2,640 feet south and 2,150 feet west of the northeast corner of sec. 33, T. 70 N., R. 3 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; very friable; slightly acid; clear smooth boundary.

A2—4 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; medium acid; clear smooth boundary.

E—8 to 12 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; dark brown (10YR 3/3) coatings on faces of plates; weak fine platy structure parting to weak very fine subangular blocky; friable; medium acid; clear smooth boundary.

BE—12 to 16 inches; brown (10YR 4/3) silty clay loam; dark brown (10YR 3/3) coatings on faces of some peds; few fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine subangular blocky structure; friable; pale brown (10YR 6/3) silt coatings on faces of peds when dry; strongly acid; clear smooth boundary.

Bt1—16 to 24 inches; brown (10YR 4/3) silty clay loam; brown (10YR 4/3) coatings on faces of peds; few fine distinct dark grayish brown (10YR 4/2) mottles; moderate very fine subangular blocky structure; friable; pale brown (10YR 6/3) silt coatings on faces of peds when dry; thin patchy clay films; strongly acid; clear smooth boundary.

Bt2—24 to 29 inches; brown (10YR 5/3) silty clay loam; yellowish brown (10YR 5/4) coatings on faces of peds; many fine faint grayish brown (10YR 5/2) mottles; moderate fine subangular and angular blocky structure; friable; pale brown (10YR 6/3) silt coatings on peds when dry; thin patchy clay films; strongly acid; clear smooth boundary.

Bt3—29 to 36 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium subangular blocky structure; friable; thin patchy clay films; pale brown (10YR 6/3) silt coatings on peds when dry; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

BC—36 to 45 inches; grayish brown (10YR 5/2) silty clay loam; common medium and coarse prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; friable; pale brown (10YR 6/3) silt coatings on peds when dry; many fine dark concretions (oxides); strongly acid; clear smooth boundary.

C—45 to 60 inches; grayish brown (10YR 5/2) silty clay loam; many medium and coarse prominent yellowish brown (10YR 5/6 and 5/8) mottles; massive; friable; medium acid.

The thickness of the solum ranges from 36 to 60 inches. The A or Ap horizon is 6 to 9 inches thick.

The A horizon has value of 3 and chroma of 1 or 2. It is medium acid to neutral. The E horizon has value of 3 to 5 and chroma of 2 or 3. The Bt horizon is slightly acid to strongly acid. The upper part of this horizon has value of 4 or 5 and chroma of 2 to 4, and the lower part has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 or 2.

Hoopeston series

The Hoopeston series consists of somewhat poorly drained soils on stream terraces. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. These soils formed in loamy and sandy alluvium that has been partially reworked by the wind. The native vegetation was prairie grasses. The slope ranges from 0 to 2 percent.

The Hoopeston soils are similar to the Dickinson and Elrin soils and commonly are adjacent to the Dickinson and Sparta soils. The Dickinson soils are well drained or somewhat excessively drained. Their B horizon is browner than that of the Hoopeston soils. The Elrin soils contain more clay in the upper part of the solum than the Hoopeston soils. They are in positions on the landscape similar to those of the Hoopeston soils. The excessively drained Sparta soils are downslope from the Hoopeston soils. They contain more sand and less clay throughout than the Hoopeston soils. Also, their B horizon is browner.

Typical pedon of Hoopeston sandy loam, 0 to 2 percent slopes, in an area of cropland; 1,060 feet east and 160 feet north of the southwest corner of sec. 9, T. 72 N., R. 1 W.

Ap—0 to 6 inches; very dark brown (10YR 2/2) sandy loam, dark grayish brown (10YR 4/2) dry; moderate very fine granular structure; very friable; strongly acid; abrupt smooth boundary.

A—6 to 11 inches; very dark grayish brown (10YR 3/2) sandy loam, dark grayish brown (10YR 4/2) dry; very dark brown (10YR 2/2) coatings on faces of peds; common fine faint dark brown (7.5YR 3/2) and few fine faint dark grayish brown (10YR 4/2) mottles; moderate very fine granular structure; very friable; strongly acid; clear smooth boundary.

AB—11 to 17 inches; dark brown (10YR 3/3) sandy loam, brown (10YR 4/3) dry; few fine faint dark brown (7.5YR 3/2) and few fine faint dark grayish brown (10YR 4/2) mottles; weak fine subangular blocky structure; very friable; strongly acid; clear smooth boundary.

Bw1—17 to 25 inches; brown (7.5YR 4/4) sandy loam; many fine faint dark grayish brown (10YR 4/2) and few fine distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; very friable; strongly acid; clear smooth boundary.

Bw2—25 to 30 inches; brown (10YR 4/3) loamy sand; many fine faint dark grayish brown (10YR 4/2) and few fine faint brown (7.5YR 5/4) mottles; weak fine subangular blocky structure; very friable; medium acid; clear smooth boundary.

Bw3—30 to 42 inches; dark grayish brown (10YR 4/2) loamy sand; many medium distinct dark reddish brown (5YR 3/2) and few fine distinct strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to weak fine subangular blocky; very friable; few fine dark concretions (oxides); medium acid; clear smooth boundary.

BC—42 to 60 inches; brown (7.5YR 4/4) loamy sand; many fine distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure; very friable; medium acid.

The thickness of the solum ranges from 40 to more than 60 inches. The thickness of the mollic epipedon ranges from 12 to 20 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is slightly acid to strongly acid. It dominantly is sandy loam, but the range includes fine sandy loam and loam. The Bw horizon has value of 4 or 5 and chroma of 2 to 4. It is strongly acid to slightly acid. It typically is sandy loam and loamy sand, but the range includes fine sandy loam.

Inton series

The Inton series consists of moderately well drained, moderately permeable soils on short, convex to plane side slopes and around the head of drainageways in the uplands. These soils formed in loess. The native

vegetation was deciduous trees. The slope ranges from 2 to 9 percent.

The Inton soils are similar to the Fayette soils and commonly are adjacent to the Clinton soils. The Clinton soils are generally on the higher slopes or are in positions on the landscape similar to those of the Inton soils. Their B horizon is brown at a greater depth than that of the Inton soils and contains less clay. The Fayette soils are in positions on the landscape similar to those of the Inton soils. Their B horizon is not gray.

Typical pedon of Inton silt loam, 5 to 9 percent slopes, moderately eroded, in an area of cropland; 2,325 feet east and 995 feet south of the northwest corner of sec. 28, T. 71 N., R. 2 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; mixed with streaks and patches of yellowish brown (10YR 5/4) subsoil material; weak very fine granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

Bt1—8 to 14 inches; yellowish brown (10YR 5/4) silty clay loam; brown (10YR 4/3) coatings on faces of some peds; common fine faint yellowish brown (10YR 5/6) and few fine distinct strong brown (7.5YR 5/6) mottles; moderate fine angular blocky structure; firm; very pale brown (10YR 7/3) silt coatings on faces of peds when dry; thin nearly continuous clay films; common fine roots; strongly acid; clear smooth boundary.

Bt2—14 to 23 inches; grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) silty clay loam; grayish brown (2.5Y 5/2) coatings on faces of peds; few fine prominent brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; moderate medium angular blocky structure; firm; very pale brown (10YR 7/3) silt coatings on faces of peds when dry; thin nearly continuous clay films; few fine dark oxides; yellowish brown (10YR 5/4) fillings in old root channels; common fine roots; strongly acid; clear smooth boundary.

Bt3—23 to 30 inches; light brownish gray (2.5Y 6/2) silty clay loam; grayish brown (2.5Y 5/2) coatings on faces of peds; common fine prominent brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; moderate medium angular blocky structure; firm; very pale brown (10YR 7/3) coatings on faces of many peds when dry; thin nearly continuous clay films; few fine dark oxides; common fine roots; strongly acid; clear smooth boundary.

Bt4—30 to 35 inches; light brownish gray (2.5Y 6/2) silty clay loam; gray (5Y 5/1) coatings on faces of some peds; common fine prominent yellowish brown (10YR 5/4) and common fine prominent strong brown (7.5YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; thin patchy clay films; few fine dark oxides; few fine roots; strongly acid; clear smooth boundary.

Bt5—35 to 39 inches; light olive gray (5Y 6/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) and few fine yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; friable; very thin patchy clay films; few fine dark oxides; few fine roots; strongly acid; clear smooth boundary.

C1—39 to 54 inches; light olive gray (5Y 6/2) silty clay loam; common medium prominent strong brown (7.5YR 5/6) and common medium prominent yellowish red (5YR 4/8) mottles; massive; friable; few fine roots and pores; strongly acid; gradual smooth boundary.

C2—54 to 60 inches; light olive gray (5Y 6/2) silt loam; common medium and coarse prominent strong brown (7.5YR 5/6) and common medium prominent yellowish red (5YR 4/8) mottles; massive; friable; few fine roots and pores; medium acid.

The thickness of the solum ranges from 36 to 60 inches. The Ap horizon is 5 to 9 inches thick.

The Ap horizon has value of 3 or 4 and chroma of 1 to 3. It is medium acid to neutral. It generally is silt loam, but the range includes silty clay loam. Some pedons have an E horizon. The Bt horizon is slightly acid to strongly acid. The upper part of this horizon has value of 4 and chroma of 3 or 4. The lower part has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 or 2. Mottles and iron segregations that have high value and chroma are throughout this horizon.

Kalona series

The Kalona series consists of poorly drained, moderately slowly permeable soils on upland ridgetops. These soils formed in loess. The native vegetation was prairie grasses. The slope is 0 to 1 percent.

The Kalona soils are similar to the Taintor soils and commonly are adjacent to the Taintor and Mahaska soils. The somewhat poorly drained Mahaska soils are in the more sloping areas. They contain less clay in the surface layer than the Kalona soils. Also, their B horizon is less gray. The Taintor soils are in positions on the landscape similar to those of the Kalona soils. Their surface layer contains less clay than that of the Kalona soils.

Typical pedon of Kalona silty clay loam, 0 to 1 percent slopes, in an area of cropland; 54 feet south and 36 feet west of the northeast corner of sec. 18, T. 72 N., R. 4 W.

Ap—0 to 10 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; moderate very fine and fine angular blocky structure; firm; neutral; abrupt smooth boundary.

A1—10 to 14 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; moderate very fine granular structure; firm; few very fine dark concretions (oxides); neutral; clear smooth boundary.

A2—14 to 18 inches; black (N 2/0) silty clay loam, very dark gray (N 3/0) dry; moderate very fine granular structure; firm; few very fine dark concretions (oxides); slightly acid; clear smooth boundary.

BA—18 to 22 inches; black (10YR 2/1) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine and very fine subangular blocky structure; firm; few very fine dark concretions (oxides); slightly acid; clear smooth boundary.

Bg1—22 to 27 inches; dark gray (5Y 4/1) silty clay loam; black (10YR 2/1) coatings on faces of some peds; weak fine prismatic structure parting to moderate very fine and fine subangular blocky; firm; common very fine dark concretions (oxides); slightly acid; clear smooth boundary.

Bg2—27 to 33 inches; dark gray (5Y 4/1) silty clay loam; black (10YR 2/1) coatings on faces of some peds; moderate coarse prismatic structure parting to moderate fine subangular blocky; firm; many very fine and fine dark concretions (oxides); slightly acid; clear smooth boundary.

BCg1—33 to 41 inches; olive gray (5Y 5/2) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate fine subangular blocky; friable; slightly acid; clear smooth boundary.

BCg2—41 to 56 inches; mottled strong brown (7.5YR 5/8) and olive gray (5Y 5/2) silty clay loam; moderate fine subangular blocky structure; friable; neutral; clear smooth boundary.

Cg—56 to 60 inches; olive gray (5Y 5/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) mottles; massive; friable; slight effervescence; neutral.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the mollic epipedon ranges from 12 to 24 inches.

The A horizon has value of 2 and chroma of 0 or 1. It is medium acid to neutral. It is silty clay loam or silty clay. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2. It is medium acid to neutral. It is silty clay loam or silty clay.

Keomah series

The Keomah series consists of somewhat poorly drained, moderately slowly permeable soils on ridgetops in the uplands. These soils formed in loess. The native vegetation was deciduous trees. The slope ranges from 1 to 3 percent.

The Keomah soils are similar to the Givin soils and commonly are adjacent to the Clinton and Givin soils. The Clinton soils are moderately well drained and are in downslope areas. Their B horizon is browner than that of the Keomah soils. The Givin soils are in positions on the landscape similar to those of the Keomah soils. Their Ap horizon is thicker or darker than that of the Keomah soils.

Typical pedon of Keomah silt loam, 1 to 3 percent slopes, in an area of cropland; 1,980 feet north and 1,980 feet east of the southwest corner of sec. 19, T. 69 N., R. 3 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate very fine granular structure; friable; neutral; abrupt smooth boundary.

E1—8 to 14 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; grayish brown (10YR 5/2) coatings on horizontal faces of plates; few fine distinct dark brown (7.5YR 4/4) mottles; moderate thin platy structure; very friable; strongly acid; gradual smooth boundary.

E2—14 to 18 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) and white (10YR 8/2) dry; dark grayish brown (10YR 4/2) coatings on horizontal faces of plates; few fine distinct brown (7.5YR 5/4) mottles; moderate medium platy structure; friable; few fine distinct dark concretions (oxides); strongly acid; clear smooth boundary.

BA—18 to 22 inches; dark grayish brown (10YR 4/2) and brown (10YR 4/3) silty clay loam; grayish brown (10YR 5/2) coatings on faces of peds; few fine faint dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; light gray (10YR 7/2) silt coatings on faces of peds when dry; few fine dark concretions (oxides); strongly acid; gradual smooth boundary.

Bt1—22 to 28 inches; brown (10YR 4/3) and dark grayish brown (10YR 4/2) silty clay loam, brown (10YR 4/3) kneaded; dark grayish brown (10YR 4/2) coatings on faces of peds; common fine distinct strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular and angular blocky structure; firm; thin continuous clay films; strongly acid; diffuse smooth boundary.

Bt2—28 to 34 inches; dark grayish brown (10YR 4/2) and brown (10YR 4/3) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of peds; few

fine faint grayish brown (10YR 5/2) and few fine distinct strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular and angular blocky structure; firm; dark organic stains on faces of some peds; thin nearly continuous clay films; strongly acid; diffuse smooth boundary.

Bt3—34 to 40 inches; dark grayish brown (10YR 4/2) and brown (10YR 4/3) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of peds; few fine faint grayish brown (10YR 5/2) and few fine distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; dark organic stains on faces of peds; thin nearly continuous clay films; common fine dark concretions (oxides); strongly acid; diffuse smooth boundary.

BC—40 to 48 inches; dark grayish brown (2.5Y 4/2) and brown (10YR 4/3) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of peds; few fine faint grayish brown (10YR 5/2) and few fine distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; dark organic stains on faces of peds; thin nearly continuous clay films; common fine dark concretions (oxides); medium acid; gradual smooth boundary.

C—48 to 60 inches; dark grayish brown (2.5Y 4/2) and brown (10YR 4/3) silty clay loam; few fine faint grayish brown (10YR 5/2) and few fine distinct strong brown (7.5YR 5/6) mottles; massive; friable; medium acid.

The thickness of the solum ranges from 40 to more than 60 inches. The surface layer is 2 to 8 inches thick.

The A or Ap horizon is medium acid to neutral. It has value of 3 or 4 and chroma of 1 or 2. The value is 3 in undisturbed areas where the surface layer is less than 3 inches thick or has value of 6 or more when dry. The E horizon has value of 4 or 5 and chroma of 1 or 2. The Bt horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 2 to 4. The C horizon has value of 4 or 5 and chroma of 2 or 3.

Keswick series

The Keswick series consists of moderately well drained, slowly permeable soils. These soils are on short, convex side slopes and nose slopes in the uplands. They formed in loamy weathered glacial till. The native vegetation was deciduous trees. The slope ranges from 9 to 14 percent.

The Keswick soils commonly are adjacent to the Clinton and Lindley soils. The Clinton soils are on ridgetops and side slopes and are higher on the landscape than the Keswick soils. Also, their B horizon contains more silt and less sand. The Lindley soils are on the lower side slopes. Their B horizon contains less clay than that of the Keswick soils and is browner.

Typical pedon of Keswick loam, 9 to 14 percent slopes, moderately eroded, in an area of cropland; 700 feet north and 65 feet west of the southeast corner of sec. 24, T. 71 N., R. 4 W.

Ap—0 to 8 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; mixed with some streaks and patches of yellowish red (5YR 4/6) clay loam subsoil material; weak very fine granular structure; firm; medium acid; abrupt smooth boundary.

Bt1—8 to 13 inches; yellowish red (5YR 4/6) clay loam; few fine distinct dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky structure; firm; very thin nearly continuous clay films; few pebbles and stones; strongly acid; gradual smooth boundary.

Bt2—13 to 20 inches; strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) clay loam; few fine distinct dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky structure; firm; very thin continuous clay films; many pebbles about 10 mm in diameter; few stones and pebbles; strongly acid; clear smooth boundary.

Bt3—20 to 26 inches; yellowish red (5YR 4/6 and 5/6) clay loam; few fine distinct dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky structure; firm; very thin continuous clay films; few stones and pebbles; strongly acid; clear smooth boundary.

Bt4—26 to 35 inches; strong brown (7.5YR 5/6) clay loam; few fine faint dark grayish brown (10YR 4/2) and few fine faint yellowish red (5YR 5/6) mottles; brown (7.5YR 4/4) coatings on faces of peds; moderate fine subangular blocky structure; firm; very thin patchy clay films; few stones and pebbles; strongly acid; clear smooth boundary.

BC1—35 to 46 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct strong brown (7.5YR 5/6) and few fine faint grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate fine subangular blocky; firm; clay flows on vertical faces of prisms; dark reddish brown (5YR 2/2) stains on faces of some peds; few stones and pebbles; medium acid; gradual smooth boundary.

BC2—46 to 56 inches; yellowish brown (10YR 5/6) clay loam; few fine faint strong brown (7.5YR 5/6) and few fine distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure; firm; dark reddish brown (5YR 2/2) stains on vertical faces of some peds; few stones and pebbles; medium acid; clear smooth boundary.

C—56 to 60 inches; yellowish brown (10YR 5/6) clay loam; few fine faint strong brown (7.5YR 5/6) and few fine distinct grayish brown (10YR 5/2) mottles; massive; firm; dark reddish brown (5YR 2/2) on vertical faces of some peds; few stones and pebbles; medium acid.

The thickness of the solum ranges from 50 to more than 60 inches. The Ap horizon has value and chroma of 3 or 4. It is slightly acid to strongly acid. The E horizon, if it occurs, has value of 4 or 5 and chroma of 2 or 3. It is loam. The Bt horizon has hue of 2.5YR, 5YR, or 7.5YR, value of 4 or 5, and chroma of 4 to 8. It is strongly acid or medium acid. The C horizon has value of 4 or 5 and chroma of 4 to 6.

Klum series

The Klum series consists of moderately well drained, moderately rapidly permeable soils on flood plains. These soils formed in stratified loamy alluvium. The native vegetation was prairie grasses. The slope ranges from 0 to 2 percent.

The Klum soils commonly are adjacent to the Nodaway soils in similar positions on the landscape. The Nodaway soils contain less sand than the Klum soils.

Typical pedon of Klum fine sandy loam, 0 to 2 percent slopes, in an area of cropland; 1,810 feet west and 300 feet south of the northeast corner of sec. 26, T. 71 N., R. 4 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; very friable; neutral; clear smooth boundary.

C1—8 to 12 inches; stratified dark brown (10YR 3/3) and very dark grayish brown (10YR 3/2) sandy loam, brown (10YR 5/3) dry; massive; horizontal cleavage planes; friable; few strata of dark grayish brown (10YR 4/2) silt loam less than 1 mm thick; neutral; clear smooth boundary.

C2—12 to 25 inches; stratified dark grayish brown (10YR 4/2), very dark grayish brown (10YR 3/2), and dark brown (10YR 3/3) loam and fine sandy loam; massive; horizontal cleavage planes; very friable; neutral; gradual smooth boundary.

C3—25 to 60 inches; stratified dark brown (10YR 3/3), dark grayish brown (10YR 4/2), very dark grayish brown (10YR 3/2), brown (10YR 4/3), and grayish brown (10YR 5/2) fine sandy loam, silt loam, and loam; massive; horizontal cleavage planes; very friable; neutral.

The solum and the mollic epipedon are 6 to 10 inches thick. The A horizon has value and chroma of 2 or 3. It is neutral or slightly acid. The C horizon has value of 3 to 6 and chroma of 2 to 4. It is stratified loam, fine sandy loam, sandy loam, and silt loam. It generally is neutral but may be slightly acid.

Ladoga series

The Ladoga series consists of moderately well drained, moderately permeable soils on convex ridgetops and side slopes in the uplands. These soils formed in loess. The native vegetation was mixed prairie grasses and deciduous trees. The slope ranges from 2 to 9 percent.

The Ladoga soils are similar to the Clinton and Hedrick soils and commonly are adjacent to the Otley, Givin, and Hedrick soils. The Clinton, Hedrick, and Otley soils are in positions on the landscape similar to those of the Ladoga soils. The surface layer of the Clinton soils is lighter colored or thinner than that of the Ladoga soils. The Otley soils have a mollic epipedon that is 10 to 20 inches thick. The B horizon of the Hedrick soils contains less clay than that of the Ladoga soils. The somewhat poorly drained Givin soils are in the more nearly level upslope areas. Their B horizon is grayer than that of the Ladoga soils.

Typical pedon of Ladoga silt loam, 2 to 5 percent slopes, in a pastured area; 1,620 feet west and 300 feet south of the northeast corner of sec. 10, T. 69 N., R. 3 W.

A—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; friable; slightly acid; clear smooth boundary.

E—8 to 11 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; dark brown (10YR 3/3) coatings on faces of some peds; weak very fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bt1—11 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate very fine and fine subangular blocky structure; friable; thin patchy clay films; few fine dark concretions (oxides); medium acid; clear smooth boundary.

Bt2—15 to 23 inches; dark yellowish brown (10YR 4/4) silty clay loam; brown (10YR 4/3) coatings on faces of peds; common pale brown (10YR 6/3) silt coatings on faces of peds; moderate and strong fine subangular blocky structure; firm; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

Bt3—23 to 33 inches; dark yellowish brown (10YR 4/4) silty clay loam; common very pale brown (10YR 7/3) sand and silt coatings on faces of peds; few fine faint brown (10YR 5/3) mottles; strong fine and medium subangular and angular blocky structure; firm; thin nearly continuous clay films on faces of peds; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

Bt4—33 to 39 inches; grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) silty clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous clay film on faces of prisms; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

BC—39 to 47 inches; grayish brown (2.5Y 5/2) and brown (10YR 5/3) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; friable; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

C—47 to 60 inches; dark yellowish brown (10YR 4/4) silty clay loam; many fine distinct grayish brown (2.5Y 5/2) mottles; massive; friable; few fine dark concretions (oxides); strongly acid.

The thickness of the solum ranges from 36 to more than 60 inches. The mollic colors extend to a depth of 6 to 10 inches.

The Ap or A horizon has value of 2 or 3 and chroma of 1 or 2. It is neutral or slightly acid. The E horizon has value of 4 or 5 and chroma of 2 or 3. The Bt horizon has value of 4 or 5 and chroma of 2 to 4. It is medium acid or strongly acid. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4.

Lawson series

The Lawson series consists of somewhat poorly drained, moderately permeable soils on flood plains along the rivers and major streams. These soils formed in silty alluvium. The native vegetation was prairie grasses. The slope ranges from 0 to 2 percent.

The Lawson soils commonly are adjacent to the Colo and Nodaway soils on flood plains. The poorly drained Colo soils are farther from the stream channels than the Lawson soils. Also, they contain more clay and have a thicker mollic epipedon. The Nodaway soils are near the stream channels. They are stratified within a depth of 24 inches. Their surface layer is thinner than that of the Lawson soils.

Typical pedon of Lawson silt loam, 0 to 2 percent slopes, in an area of cropland; 1,800 feet north and 860 feet west of the southeast corner of sec. 25, T. 69 N., R. 3 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak very fine granular structure; friable; neutral; abrupt smooth boundary.

A1—8 to 18 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate very fine granular structure; friable; neutral; gradual smooth boundary.

A2—18 to 34 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate very fine granular structure; friable; neutral; clear wavy boundary.

C—34 to 60 inches; stratified dark brown (10YR 3/3), very dark grayish brown (10YR 3/2), and dark grayish brown (10YR 4/2) silt loam; few fine distinct yellowish brown (10YR 5/4) mottles; massive; horizontal cleavage planes; friable; neutral.

The thickness of the solum, or the A horizon, ranges from 24 to 36 inches. The A horizon has value of 2 or 3 and chroma of 1 or 2. It is neutral or slightly acid. The C horizon has value of 3 to 6 and chroma of 1 to 3. It is silt loam or silty clay loam.

Lindley series

The Lindley series consists of well drained, moderately slowly permeable soils on convex side slopes in the uplands. These soils formed in glacial till. The native vegetation was deciduous trees. The slope ranges from 9 to 40 percent.

The Lindley soils are similar to the Douds, Gara, and Keswick soils and commonly are adjacent to the Clinton and Keswick soils. The Clinton soils are upslope from the Lindley soils. Their solum contains less sand throughout. The Douds soils contain more sand in the lower part of the solum than the Lindley soils. The dark A1 or Ap horizon of the Gara soils is thicker than that of the Lindley soils. The Keswick soils contain more clay than the Lindley soils. Also, their B horizon is redder.

Typical pedon of Lindley loam, 14 to 18 percent slopes, in a timbered area; 1,920 feet west and 800 feet north of the southeast corner of sec. 15, T. 69 N., R. 3 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; medium acid; abrupt smooth boundary.

E—3 to 7 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; dark grayish brown (10YR 4/2) coatings on faces of peds; moderate medium platy structure; friable; medium acid; abrupt smooth boundary.

BE—7 to 11 inches; yellowish brown (10YR 5/6) loam; mixed with dark brown (10YR 3/3) material; dark yellowish brown (10YR 4/4) coatings on faces of peds; moderate fine and very fine subangular and angular blocky structure; friable; strongly acid; clear smooth boundary.

Bt1—11 to 19 inches; yellowish brown (10YR 5/6) clay loam; moderate fine subangular and angular blocky structure; firm; thin nearly continuous clay films; strongly acid; clear smooth boundary.

Bt2—19 to 29 inches; yellowish brown (10YR 5/6) clay loam; yellowish brown (10YR 5/4) coatings on faces of peds; few fine distinct grayish brown (10YR 5/2) and few fine faint strong brown (7.5YR 5/6) mottles; moderate fine subangular and angular blocky structure; firm; thin continuous clay films; light brownish gray (10YR 6/2) silt and sand coatings on faces of peds when dry; strongly acid; gradual smooth boundary.

Bt3—29 to 40 inches; yellowish brown (10YR 5/6) clay loam; yellowish brown (10YR 5/4) coatings on faces of peds; common fine faint grayish brown (10YR 5/2) and common fine distinct strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; firm; thin continuous clay films; strongly acid; gradual smooth boundary.

BC1—40 to 55 inches; strong brown (7.5YR 5/6) clay loam; common fine faint yellowish brown (10YR 5/4), few fine faint strong brown (7.5YR 5/8), and few fine distinct light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; firm; lenses of sandy loam 1 inch thick at a depth of 48 inches; medium acid; clear smooth boundary.

BC2—55 to 60 inches; strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few very dark organic stains on faces of some peds; medium acid.

The thickness of the solum ranges from 36 to 60 inches. The A or Ap horizon is 2 to 5 inches thick. The E horizon is 0 to 7 inches thick.

The A horizon has value of 3 or 4 and chroma of 1 or 2. It is medium acid or strongly acid unless limed. The Ap horizon, if it occurs, has value of 4 or 5 and chroma of 2 to 5. The E horizon has value of 4 to 6 and chroma of 2 to 4. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It typically is clay loam but in some pedons is loam. It is strongly acid to slightly acid.

Mahaska series

The Mahaska series consists of somewhat poorly drained, moderately permeable soils on ridgetops in the uplands. These soils formed in loess. The native vegetation was prairie grasses. The slope ranges from 1 to 3 percent.

The Mahaska soils are similar to the Grundy soils and commonly are adjacent to the Otley and Taintor soils. The Grundy soils are in positions on the landscape similar to those of the Mahaska soils. Their B horizon contains more clay than that of the Mahaska soils. The Otley soils are lower on the landscape than the Mahaska soils. Also, their B horizon is browner. The Taintor soils are in the more nearly level areas on ridgetops and are poorly drained.

Typical pedon of Mahaska silty clay loam, 1 to 3 percent slopes, in an area of corn; 70 feet south and 250 feet east of the center of sec. 16, T. 72 N., R. 4 W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; medium acid; abrupt smooth boundary.

A—10 to 14 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; strongly acid; gradual smooth boundary.

AB—14 to 18 inches; very dark grayish brown (10YR 3/2) silty clay loam; very dark brown (10YR 2/2) coatings on faces of peds; moderate very fine subangular blocky structure; friable; strongly acid; gradual smooth boundary.

BA—18 to 22 inches; very dark grayish brown (10YR 3/2) silty clay loam; very dark brown (10YR 2/2) coatings on faces of peds; moderate fine subangular blocky structure; friable; strongly acid; gradual smooth boundary.

Bt1—22 to 26 inches; dark grayish brown (10YR 4/2) silty clay loam; very dark grayish brown (10YR 3/2) coatings on faces of peds; common fine faint brown (10YR 5/3) mottles; moderate fine subangular blocky structure; friable; very thin patchy clay films; strongly acid; clear smooth boundary.

Bt2—26 to 32 inches; dark grayish brown (10YR 4/2) silty clay loam; many very dark gray (10YR 3/1) coatings on faces of peds; few fine distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; very thin nearly continuous clay films; few fine dark concretions (oxides); medium acid; clear smooth boundary.

Bt3—32 to 38 inches; dark grayish brown (2.5Y 4/2) silty clay loam; few very dark gray (10YR 3/1) coatings on faces of peds; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; very thin nearly continuous clay films; few fine dark concretions (oxides); medium acid; gradual smooth boundary.

Bt4—38 to 52 inches; dark grayish brown (2.5Y 4/2) silty clay loam; some very dark gray (10YR 3/1) stains on peds; common fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; very thin patchy clay films on faces of prisms; few fine dark concretions (oxides); medium acid; gradual smooth boundary.

Bt5—52 to 60 inches; mottled grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/4) silty clay loam; very dark grayish brown (10YR 3/2) coatings on vertical faces of peds; moderate medium prismatic structure; friable; very thin patchy clay films; few fine dark concretions (oxides); medium acid.

The thickness of the solum ranges from 48 to 72 inches. The thickness of the mollic epipedon ranges from 14 to 24 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is strongly acid to slightly acid. The content of clay is 36 to 42 percent in the finest textured part of this horizon.

Niota Variant

The Niota Variant consists of poorly drained, very slowly permeable soils on alluvial terraces. These soils formed in silty and clayey alluvium. The native vegetation was prairie grasses and deciduous trees. The slope ranges from 0 to 14 percent.

The Niota Variant soils are similar to the Belinda soils and commonly are adjacent to the Lindley soils. The Belinda soils have an E horizon and formed in loess. The Lindley soils contain less clay and more sand throughout the solum than the Niota Variant soils. They are on the side slopes in the uplands.

Typical pedon of Niota Variant silty clay loam, 0 to 3 percent slopes, in an area of cropland; 1,375 feet south and 750 feet east of the northwest corner of sec. 20, T. 70 N., R. 2 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; few fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine granular structure; firm; strongly acid; abrupt smooth boundary.

Bt1—7 to 15 inches; dark grayish brown (10YR 4/2) silty clay, light brownish gray (10YR 6/2) dry; very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine distinct dark yellowish brown (10YR 4/4) mottles; strong very fine subangular blocky structure; firm; thin patchy clay films; strongly acid; clear smooth boundary.

Bt2—15 to 25 inches; brown (7.5YR 4/2) silty clay; very dark grayish brown (10YR 3/2) coatings on faces of some peds; few fine distinct yellowish brown (10YR 5/4) mottles; strong very fine subangular blocky structure; firm; thin nearly continuous clay films; strongly acid; clear smooth boundary.

Bt3—25 to 32 inches; brown (7.5YR 4/2) clay; few fine distinct yellowish brown (10YR 5/6) mottles; strong fine subangular and angular blocky structure; firm; thin nearly continuous clay films; few fine dark concretions (oxides); medium acid; clear smooth boundary.

Bt4—32 to 44 inches; brown (7.5YR 4/2) clay; strong fine and medium subangular and angular blocky structure; firm; thin nearly continuous clay films; few fine dark concretions (oxides); medium acid; clear smooth boundary.

Bt5—44 to 50 inches; brown (7.5YR 4/2) silty clay; strong fine and medium subangular and angular blocky structure; firm; thin nearly continuous clay films; slightly acid; clear smooth boundary.

Bt6—50 to 60 inches; dark reddish gray (5YR 4/2) silty clay; strong very fine and fine subangular and angular blocky structure; firm; thin nearly continuous clay films; slight effervescence; neutral.

The thickness of the solum ranges from 50 to more than 60 inches. The mollic colors extend to a depth of 6 to 10 inches.

The A or Ap horizon has value of 2 or 3 and chroma of 1 or 2. It is strongly acid to neutral. The Bt horizon has hue of 5YR, 7.5YR, or 10YR, value of 4 to 6, and chroma of 2 to 4. It is silty clay or clay. It is strongly acid to neutral.

Nira series

The Nira series consists of moderately well drained, moderately permeable soils on ridgetops, in coves at the head of drainageways, and on short, convex to plane side slopes surrounding the nearly level areas on upland divides. These soils formed in loess. The native vegetation was prairie grasses. The slope ranges from 2 to 9 percent.

The Nira soils commonly are adjacent to the Mahaska and Otley soils. The somewhat poorly drained Mahaska soils are higher on the landscape than the Nira soils. Also, they contain more clay. The Otley soils are in positions on the landscape similar to those of the Nira soils. They contain more clay than the Nira soils. Also, their B horizon is browner.

Typical pedon of Nira silty clay loam, 2 to 5 percent slopes, in a pastured area; 75 feet east and 496 feet north of the southwest corner of sec. 36, T. 72 N., R. 4 W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, gray (10YR 5/1) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A—8 to 11 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; very dark brown (10YR 2/2) coatings on faces of peds; moderate fine granular structure; friable; neutral; clear smooth boundary.

AB—11 to 14 inches; very dark grayish brown (10YR 3/2) silty clay loam; very dark brown (10YR 2/2) coatings on faces of some peds; weak fine subangular blocky structure; friable; medium acid; clear smooth boundary.

Bt—14 to 22 inches; brown (10YR 4/3) silty clay loam; very dark grayish brown (10YR 3/2) coatings on faces of peds; common fine faint dark grayish brown (10YR 4/2) and few fine distinct brown (7.5YR 4/4) mottles; moderate very fine and fine subangular blocky structure; friable; medium acid; clear smooth boundary.

Bw1—22 to 27 inches; dark grayish brown (10YR 4/2) silty clay loam; very dark gray (10YR 3/1) coatings on faces of some peds; common fine distinct brown (7.5YR 4/4) and common fine distinct strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; friable; thin discontinuous clay films; few fine dark concretions (oxides); medium acid; clear smooth boundary.

Bw2—27 to 35 inches; olive gray (5Y 5/2) silty clay loam; grayish brown (2.5Y 5/2) coatings on faces of some peds; common fine prominent strong brown (7.5YR 5/6) mottles; moderate fine and very fine subangular blocky structure; friable; few fine dark concretions (oxides); medium acid; clear smooth boundary.

BC—35 to 46 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) and few fine prominent yellowish red (5YR 4/6) mottles; moderate medium prismatic structure; friable; dark grayish brown (10YR 4/2) material in root channels; few fine dark concretions (oxides); medium acid; clear smooth boundary.

C—46 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) and few fine prominent yellowish red (5YR 4/6) mottles; massive; friable; dark grayish brown (10YR 4/2) material in root channels; few fine dark concretions (oxides); medium acid.

The thickness of the solum ranges from 30 to 50 inches. The thickness of the mollic epipedon ranges from 10 to 15 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. The Bt and Bw horizons are medium acid or strongly acid. The Bt horizon and the upper part of the Bw horizon have value of 4 and chroma of 2 to 4. The lower part of the Bw horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 or 2.

Nodaway series

The Nodaway series consists of moderately well drained, moderately permeable soils on flood plains along the rivers and major streams. These soils formed in stratified silty and loamy alluvium. The native vegetation was deciduous trees and prairie grasses. The slope ranges from 0 to 5 percent.

The Nodaway soils are similar to the Ackmore and Dorchester soils and commonly are adjacent to the Klum and Lawson soils in similar positions on the landscape. The Ackmore soils have a buried A horizon within a depth of 40 inches. The Dorchester soils have free carbonates throughout the solum. The Klum soils contain more sand than the Nodaway soils. The Lawson soils are not stratified within a depth of 24 inches.

Typical pedon of Nodaway silt loam, 0 to 2 percent slopes, in an area of cropland; 660 feet south and 1,790 feet west of the northeast corner of sec. 26, T. 71 N., R. 4 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; mixed with streaks and patches of dark grayish brown (10YR 4/2) underlying material; weak very fine granular structure; friable; neutral; abrupt smooth boundary.

C1—10 to 26 inches; stratified very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), and very dark gray (10YR 3/1) silt loam; thin strata of loam and fine sandy loam; few fine distinct brown (7.5YR 4/4) mottles; massive; horizontal cleavage planes; friable; neutral; clear smooth boundary.

C2—26 to 42 inches; stratified very dark gray (10YR 3/1), dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), and very dark grayish brown (10YR 3/2) silt loam; thin strata of loam and fine sandy loam; common fine distinct brown (7.5YR 4/4) mottles; massive; horizontal cleavage planes; friable; neutral; clear smooth boundary.

C3—42 to 60 inches; stratified dark grayish brown (10YR 4/2) and very dark gray (10YR 3/1) silt loam and silty clay loam; common fine prominent reddish brown (5YR 4/4) and few fine prominent yellowish red (5YR 4/8) mottles; massive; horizontal cleavage planes; friable; neutral.

The thickness of the solum, or the surface layer, is 6 to 10 inches. The A or Ap horizon has chroma of 1 or 2. It is neutral or slightly acid. The C horizon has value of 3 to 5 and chroma of 1 to 4. It is neutral or slightly acid. It is dominantly silt loam but has thin strata of silty clay loam, fine sandy loam, and loam. The sand in this horizon is fine or very fine.

Nordness series

The Nordness series consists of well drained, moderately permeable soils on side slopes and escarpments in the uplands. These soils formed in silty and loamy material over limestone bedrock. The native vegetation was deciduous trees. The slope ranges from 14 to 40 percent.

The Nordness soils commonly are adjacent to the Lindley soils. The Lindley soils are upslope from the Nordness soils. They are not shallow to limestone bedrock.

Typical pedon of Nordness silt loam, 14 to 25 percent slopes, in a timbered area; 830 feet north and 2,030 feet west of the southeast corner of sec. 12, T. 69 N., R. 4 W.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; neutral; abrupt smooth boundary.

E1—2 to 4 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; dark brown (10YR 3/3) coatings on faces of peds; weak very thin platy structure; very friable; medium acid; abrupt smooth boundary.

E2—4 to 6 inches; brown (10YR 4/3) silt loam; dark yellowish brown (10YR 4/4) coatings on faces of peds; weak thin platy structure; friable; medium acid; abrupt smooth boundary.

BE—6 to 9 inches; brown (10YR 4/3) loam; dark yellowish brown (10YR 4/4) coatings on faces of peds; weak very fine and fine subangular blocky structure; friable; medium acid; abrupt smooth boundary.

2Bt—9 to 15 inches; brown (7.5YR 4/4) clay loam; dark yellowish brown (10YR 4/4) coatings on faces of some peds; moderate fine subangular blocky structure; firm; thin continuous clay films; medium acid; abrupt wavy boundary.

2R—15 to 19 inches; hard fractured limestone bedrock.

The solum ranges from 8 to 20 inches in thickness. It is terminated by hard fractured limestone bedrock. The A horizon is 1 to 8 inches thick. It has value of 3 or 4 and chroma of 1 or 2. It is medium acid to neutral. It generally is silt loam, but the range includes loam. The BE and 2Bt horizons have value of 4 or 5 and chroma of 3 or 4. They are loam, silt loam, silty clay loam, and clay loam. They are medium acid to neutral.

Okaw series

The Okaw series consists of poorly drained or very poorly drained, very slowly permeable soils on low terraces along the major and minor streams. These soils formed in alluvium. The native vegetation was deciduous trees. The slope ranges from 0 to 5 percent.

The Okaw soils in this county do not have an abrupt increase in content of clay, and their A1 or Ap horizon is darker than is defined as the range for the Okaw series.

The Okaw soils commonly are adjacent to the Lawson and Nodaway soils. The Lawson and Nodaway soils are lower on the landscape than the Okaw soils. Also, their solum contains less clay and more silt throughout.

Typical pedon of Okaw silt loam, 0 to 2 percent slopes, in an area of cropland; 1,830 feet north and 1,530 feet east of the southwest corner of sec. 22, T. 71 N., R. 4 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; mixed with some streaks and patches of dark grayish brown (10YR 4/2) material; weak very fine granular structure; friable; medium acid; abrupt smooth boundary.

E1—8 to 12 inches; light brownish gray (10YR 6/2) silt loam, white (10YR 8/2) dry; few fine distinct yellowish brown (10YR 5/6) mottles; moderate thin platy structure; friable; very strongly acid; clear smooth boundary.

E2—12 to 15 inches; light brownish gray (10YR 6/2) silt loam, white (10YR 8/2) dry; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium platy structure; friable; very strongly acid; abrupt smooth boundary.

Btg1—15 to 19 inches; grayish brown (10YR 5/2) silty clay loam; many fine prominent strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; friable; thin patchy clay films; light gray (10YR 7/2) silt coatings on faces of peds when dry; few dark concretions (oxides); strongly acid; clear smooth boundary.

Btg2—19 to 27 inches; grayish brown (2.5Y 5/2) silty clay loam; grayish brown (10YR 5/2) coatings on faces of peds; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin nearly continuous clay films; light brownish gray (10YR 6/2) silt coatings on faces of peds when dry; few fine dark concretions (oxides); strongly acid; gradual smooth boundary.

Btg3—27 to 38 inches; grayish brown (2.5Y 5/2) silty clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin nearly continuous clay films; light brownish gray (10YR 6/2) silt coatings on faces of peds when dry; dark stains on faces of some peds; many fine dark concretions (oxides); strongly acid; gradual smooth boundary.

Btg4—38 to 47 inches; grayish brown (2.5Y 5/2) silty clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; friable; thin patchy clay films; dark stains in old root channels; common fine dark concretions (oxides); strongly acid; clear smooth boundary.

BCg—47 to 52 inches; light brownish gray (2.5Y 6/2)

silty clay loam; common fine distinct strong brown (7.5YR 5/6 and 5/8) mottles; weak coarse prismatic structure; friable; dark stains on faces of some peds; medium acid; gradual smooth boundary.

Cg—52 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and few fine distinct strong brown (7.5YR 5/6 and 5/8) mottles; massive; friable; few dark concretions (oxides); medium acid.

The thickness of the solum ranges from 40 to 55 inches. The surface layer is 5 to 9 inches thick.

The A or Ap horizon has value of 4 or 5 and chroma of 2 or 3. It is medium acid or strongly acid. The E horizon has value of 5 to 7 and chroma of 2 or 3. The Btg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 2 or less. It is silty clay loam, silty clay, or clay. It is strongly acid or medium acid. The C horizon ranges from silty clay loam to clay.

Olmitz Variant

The Olmitz Variant consists of well drained or moderately well drained, moderately permeable soils on alluvial fans at or near the mouth of upland drainageways and on foot slopes. These soils formed in loamy local alluvium derived from glacial till. The native vegetation was prairie grasses. The slope ranges from 2 to 10 percent.

The Olmitz Variant soils commonly are adjacent to the Lindley soils on side slopes. The Lindley soils do not have a mollic epipedon. They have higher value and chroma in the B horizon than the Olmitz Variant soils.

Typical pedon of Olmitz Variant loam, 5 to 10 percent slopes, in a pastured area; 1,675 feet south and 750 feet east of the northwest corner of sec. 10, T. 70 N., R. 2 W.

Ap—0 to 6 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; moderate very fine granular structure; friable; few lime fragments; slight effervescence; mildly alkaline; clear smooth boundary.

A1—6 to 12 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; moderate very fine subangular blocky structure; friable; numerous pebbles 2 to 10 mm in size, a few 30 mm in size; few lime fragments; slight effervescence; mildly alkaline; clear smooth boundary.

A2—12 to 17 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; few fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine subangular blocky structure; friable; few lime fragments; slight effervescence; mildly alkaline; clear smooth boundary.

AB—17 to 26 inches; dark brown (10YR 3/3) clay loam, brown (10YR 5/3) dry; few fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine subangular blocky structure; friable; few pebbles 2 to 10 mm in size; few lime fragments; slight effervescence; mildly alkaline; gradual smooth boundary.

Bw—26 to 60 inches; brown (10YR 4/3) clay loam; moderate very fine subangular blocky structure; friable; few fine dark concretions (oxides); mildly alkaline.

The thickness of the solum ranges from 50 to more than 60 inches. The thickness of the mollic epipedon ranges from 24 to 32 inches.

The A horizon has value of 3 and chroma of 2 or 3. It is mildly alkaline or neutral. The Bw horizon has value of 4 and chroma of 3 or 4. It is mildly alkaline or neutral.

Otley series

The Otley series consists of moderately well drained, moderately permeable soils on convex ridgetops and side slopes in the uplands. These soils formed in loess. The native vegetation was prairie grasses. The slope ranges from 2 to 9 percent.

The Otley soils commonly are adjacent to the nearly level Mahaska and Taintor soils in upslope areas. The somewhat poorly drained Mahaska and poorly drained Taintor soils have lower chroma in the B horizon than the Otley soils.

Typical pedon of Otley silty clay loam, 2 to 5 percent slopes, in a pastured area; 616 feet south and 230 feet east of the northwest corner of sec. 27, T. 72 N., R. 4 W.

A1—0 to 6 inches; very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) dry; weak very fine granular structure; friable; slightly acid; clear smooth boundary.

A2—6 to 10 inches; very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) dry; weak very fine subangular blocky structure; friable; medium acid; clear smooth boundary.

AB—10 to 14 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 5/3) dry; very dark grayish brown (10YR 3/2) coatings on faces of some peds; weak very fine subangular blocky structure; friable; some very dark brown (10YR 2/2) fillings in root channels; medium acid; clear smooth boundary.

Bt1—14 to 18 inches; brown (10YR 4/3) silty clay loam; moderate very fine subangular blocky structure; friable; thin patchy clay films; few fine dark concretions (oxides); medium acid; clear smooth boundary.

Bt2—18 to 24 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; thin nearly continuous clay films; common fine dark concretions (oxides); dark organic stains in root channels; medium acid; gradual smooth boundary.

Bt3—24 to 29 inches; brown (10YR 5/3) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; thin nearly continuous clay films; common fine dark concretions (oxides); medium acid; gradual smooth boundary.

Bt4—29 to 36 inches; brown (10YR 4/3) silty clay loam; common fine faint dark grayish brown (10YR 4/2) and common fine faint dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; thin nearly continuous clay films; few fine dark concretions (oxides); medium acid; gradual smooth boundary.

BC1—36 to 42 inches; grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of peds; common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; medium acid; clear smooth boundary.

BC2—42 to 49 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine faint yellowish brown (10YR 5/4) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure; friable; common fine dark concretions (oxides); medium acid; clear smooth boundary.

C1—49 to 56 inches; mottled dark grayish brown (10YR 4/2) and brown (7.5YR 4/4) silty clay loam; moderate medium and coarse subangular blocky structure; friable; common fine dark concretions (oxides); medium acid; clear smooth boundary.

C2—56 to 60 inches; strong brown (7.5YR 5/6) silty clay loam; common medium distinct dark gray (10YR 4/1) mottles; massive; firm; common fine dark concretions (oxides); medium acid.

The thickness of the solum ranges from 48 to more than 60 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon has value of 2 or 3 and chroma of 1 to 3. It is slightly acid or medium acid. The B horizon has value of 4 or 5 and chroma of 3 or 4 in the upper part. It typically is medium acid or strongly acid but may be slightly acid in the lower part. The C horizon has value of 4 to 6 and chroma of 2 to 8. It typically is silty clay loam but in some pedons is loam.

Pershing series

The Pershing series consists of moderately well drained or somewhat poorly drained, slowly permeable soils on convex ridgetops and side slopes in the uplands. These soils formed in loess. The native vegetation was mixed prairie grasses and deciduous trees. The slope ranges from 2 to 9 percent.

The Pershing soils are similar to the Givin soils and commonly are adjacent to the Belinda and Weller soils. The poorly drained Belinda soils are less sloping than the Pershing soils and are higher on the landscape. Also, their B horizon is grayer. The somewhat poorly drained Givin and moderately well drained Weller soils are in positions on the landscape similar to those of the Pershing soils. The B horizon of the Givin soils contains less clay than that of the Pershing soils. The B horizon of the Weller soils is browner than that of the Pershing soils.

Typical pedon of Pershing silt loam, 2 to 5 percent slopes, in a cultivated field; 2,125 feet west and 124 feet north of the southeast corner of sec. 29, T. 70 N., R. 4 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; mixed with some streaks and patches of dark grayish brown (10YR 4/2) material; moderate very fine granular structure; friable; neutral; abrupt smooth boundary.

BE—9 to 12 inches; brown (10YR 5/3) silty clay loam; very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine faint yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) mottles; moderate very fine subangular blocky structure; friable; light brownish gray (10YR 6/2) silt coatings on faces of peds when dry; medium acid; clear smooth boundary.

Bt1—12 to 19 inches; dark grayish brown (10YR 4/2) silty clay loam; many fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; strong very fine subangular blocky structure; firm; very thin continuous clay films; pale brown (10YR 6/3) silt coatings on faces of peds when dry; few fine dark oxides; strongly acid; clear smooth boundary.

Bt2—19 to 28 inches; dark grayish brown (10YR 4/2) silty clay; many fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; strong fine subangular blocky structure; firm; thin continuous clay films on faces of peds; few fine dark oxides; few very dark gray (10YR 3/1) stains on faces of peds; medium acid; clear smooth boundary.

Bt3—28 to 37 inches; dark grayish brown (10YR 4/2) silty clay; very dark gray (10YR 3/1) stains on faces of many peds and in old root channels; many fine distinct yellowish brown (10YR 5/4 and 5/6) and few fine prominent brown (7.5YR 4/4) mottles; strong fine and medium subangular blocky structure; firm; very thin nearly continuous clay films on faces of peds; few fine dark oxides; few fine dark reddish brown (5YR 2/2) stains on faces of peds; medium acid; gradual smooth boundary.

Bt4—37 to 43 inches; grayish brown (10YR 5/2) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of peds; many very dark gray (10YR 3/1) stains on vertical faces of peds and in old root channels; many fine distinct yellowish brown (10YR 5/4) and few fine prominent brown (7.5YR 4/4) mottles; moderate fine and medium subangular blocky structure; firm; very thin patchy clay films on faces of peds; few fine dark oxides; medium acid; gradual smooth boundary.

Bt5—43 to 48 inches; grayish brown (2.5Y 5/2) silty clay loam; many fine distinct yellowish brown (10YR 5/4) and few fine prominent brown (7.5YR 4/4) mottles; weak medium prismatic structure parting to weak medium and fine subangular blocky; firm; very thin patchy clay films on faces of peds; common fine dark oxides; few dark reddish brown (5YR 2/2) stains on faces of peds; slightly acid; gradual smooth boundary.

BC—48 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; many fine distinct yellowish brown (10YR 5/4 and 5/6) and common fine prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure; friable; common fine dark oxides; some dark reddish brown (5YR 2/2) stains on faces of peds; slightly acid.

The thickness of the solum ranges from 60 to 80 inches. The Ap or A1 horizon is 6 to 10 inches thick.

The A or Ap horizon has value of 3 and chroma of 1 or 2. The E horizon, if it occurs, has value of 4 or 5 and chroma of 2. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is strongly acid to slightly acid.

Rinda series

The Rinda series consists of poorly drained or somewhat poorly drained, very slowly permeable soils on short, convex to plane side slopes and in coves at the upper end of drainageways in the uplands. These soils formed in clayey weathered glacial till. The native vegetation was mixed prairie grasses and deciduous trees. The slope ranges from 5 to 14 percent.

The Rinda soils are similar to the Ashgrove and Clarinda soils and commonly are adjacent to the Hedrick and Ladoga soils. The Ashgrove and Clarinda soils are in positions on the landscape similar to those of the Rinda soils. The surface layer of the Ashgrove soils is thinner or lighter colored than that of the Rinda soils. The Clarinda soils have a mollic epipedon. The Hedrick and Ladoga soils are moderately well drained. Their B horizon contains less clay than that of the Rinda soils. The Hedrick soils are on the side slopes, and the Ladoga soils are on ridgetops and side slopes.

Typical pedon of Rinda silt loam, 5 to 9 percent slopes, moderately eroded, in an area of cropland; 1,350 feet east and 1,620 feet north of the southwest corner of sec. 8, T. 71 N., R. 4 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; mixed with about 10 percent dark grayish brown (10YR 4/2) material; moderate very fine granular structure; friable; slightly acid; abrupt smooth boundary.

BE—8 to 14 inches; mottled dark grayish brown (10YR 4/2) and brown (10YR 5/3) silty clay loam, pale brown (10YR 6/3) dry; few fine faint brown (10YR 4/3) mottles; moderate very fine subangular blocky structure; friable; light gray (10YR 7/2) silt coatings on faces of many peds; medium acid; abrupt smooth boundary.

2Btg1—14 to 20 inches; dark gray (10YR 4/1) clay; few fine prominent brown (7.5YR 4/4) mottles; moderate very fine subangular blocky structure; firm; thin nearly continuous clay films; few fine dark concretions (oxides); very dark gray (10YR 3/1) stains on faces of some peds; strongly acid; gradual smooth boundary.

2Btg2—20 to 35 inches; dark grayish brown (10YR 4/2) clay; few fine prominent brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; firm; thin nearly continuous dark gray (10YR 4/1) clay films; few fine dark concretions (oxides); strongly acid; gradual smooth boundary.

2Btg3—35 to 46 inches; dark grayish brown (10YR 4/2) clay; common fine prominent brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; thin nearly continuous dark gray (10YR 4/1) clay films; few fine dark concretions (oxides); medium acid; gradual smooth boundary.

2Btg4—46 to 55 inches; dark grayish brown (10YR 4/2) silty clay; many fine prominent brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) clay films; few fine dark concretions (oxides); medium acid; gradual smooth boundary.

2Btg5—55 to 60 inches; dark grayish brown (10YR 4/2) silty clay; many fine prominent brown (7.5YR 4/4) and few fine prominent yellowish red (5YR 4/6) mottles; weak medium prismatic structure parting to moderate medium prismatic; firm; very thin patchy dark gray (10YR 4/1) clay films; few fine dark concretions (oxides); few pebbles; medium acid.

The thickness of the solum ranges from 48 to more than 60 inches. The mollic colors of the A or Ap horizon extend to a depth of 6 to 10 inches.

The A or Ap horizon has value of 3 and chroma of 1 or 2. It is slightly acid or medium acid unless limed. The E horizon, if it occurs, has value of 4 or 5 and chroma of 2 or 3. The 2Btg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is silty clay or clay. It is neutral to strongly acid.

Rubio series

The Rubio series consists of poorly drained or very poorly drained, slowly permeable soils in depressions or on broad upland divides. These soils formed in loess. The native vegetation was mixed prairie grasses and deciduous trees. The slope ranges from 0 to 2 percent.

The Rubio soils are similar to the Belinda soils and commonly are adjacent to the Givin and Ladoga soils. The Belinda soils are in positions on the landscape similar to those of the Rubio soils. Their B horizon contains more clay than that of the Rubio soils. The B horizon of the Givin and Ladoga soils is more brown than that of the Rubio soils. The somewhat poorly drained Givin soils are at the slightly higher elevations, and the moderately well drained Ladoga soils generally are downslope from the Rubio soils.

Typical pedon of Rubio silt loam, 0 to 2 percent slopes, in an area of cropland; 1,320 feet east and 400 feet north of the southwest corner of sec. 15, T. 69 N., R. 3 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

E1—8 to 14 inches; dark gray (10YR 4/1) silt loam, light brownish gray (10YR 6/2) dry; dark grayish brown (10YR 4/2) coatings on faces of peds; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium platy structure; friable; few fine dark concretions (oxides); medium acid; clear smooth boundary.

E2—14 to 18 inches; gray (10YR 5/1) silt loam, light brownish gray (10YR 6/2) dry; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium platy structure; friable; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

BEg—18 to 22 inches; dark gray (10YR 4/1) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of some peds; common fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine subangular blocky structure; friable; some light brownish gray (10YR 6/2) silt coatings on faces of peds when dry; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

Btg1—22 to 30 inches; olive gray (5Y 5/2) silty clay loam; grayish brown (10YR 5/2) coatings on faces of peds; common fine faint gray (5Y 5/1) and many fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular and angular blocky structure; firm; thin continuous clay films; many light brownish gray (10YR 6/2) silt coatings on faces of peds when dry; few fine dark concretions (oxides); medium acid; clear smooth boundary.

Btg2—30 to 37 inches; olive gray (5Y 5/2) silty clay; common fine faint gray (10YR 5/1) and common fine faint strong brown (7.5YR 5/6 and 5/8) mottles; moderate medium subangular blocky structure; firm; few dark stains on vertical faces of peds; thin continuous clay films; few fine dark concretions (oxides); medium acid; clear smooth boundary.

Btg3—37 to 45 inches; gray (5Y 5/1) and olive gray (5Y 5/2) silty clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; clay flows in root channels; common fine dark concretions (oxides); medium acid; clear smooth boundary.

BCg—45 to 55 inches; gray (10YR 5/1) silty clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; clay flows in root channels and on vertical faces of peds; many fine dark concretions (oxides); slightly acid; clear smooth boundary.

Cg—55 to 60 inches; olive gray (5Y 5/2) silty clay loam; common fine distinct dark gray (10YR 4/1) and many fine distinct strong brown (7.5YR 5/6 and 5/8) mottles; massive; firm; common fine dark concretions (oxides); slightly acid.

The thickness of the solum ranges from 45 to more than 60 inches. The A or Ap horizon is 6 to 10 inches thick. It has value of 3 and chroma of 1 or 2. The E horizon has value of 4 or 5 and chroma of 1 or 2. The Btg horizon has hue of 10YR or 5Y, value of 4 or 5, and chroma of 1 or 2. The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2.

Shaffton series

The Shaffton series consists of somewhat poorly drained soils on flood plains. Permeability is moderate in the upper part of the solum and rapid in the lower part. These soils formed in loamy and sandy alluvium. The native vegetation was prairie grasses. The slope ranges from 0 to 2 percent.

The Shaffton soils in this county contain more sand and less clay than is defined as the range for the Shaffton series.

The Shaffton soils commonly are adjacent to the Dolbee and Titus soils. The Dolbee and Titus soils commonly are in the slightly lower areas on flood plains. Their solum contains more clay and less sand throughout than that of the Shaffton soils.

Typical pedon of Shaffton loam, 0 to 2 percent slopes, in an area of cropland; 2,810 feet west and 380 feet south of the northeast corner of sec. 5, T. 72 N., R. 1 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak very fine granular structure; friable; slightly acid; clear smooth boundary.

A—7 to 12 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak very fine subangular blocky structure; friable; medium acid; abrupt smooth boundary.

BA—12 to 18 inches; dark grayish brown (10YR 4/2) loam; few fine faint brown (10YR 4/3) and few fine distinct brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; weak very fine subangular blocky structure; friable; medium acid; clear smooth boundary.

Bw1—18 to 23 inches; brown (10YR 4/3) and dark yellowish brown (10YR 4/4) loam; common fine faint dark grayish brown (10YR 4/2) and common fine distinct strong brown (7.5YR 5/6) mottles; weak very fine subangular blocky structure; friable; medium acid; clear smooth boundary.

Bw2—23 to 29 inches; grayish brown (10YR 5/2) and brown (10YR 5/3) fine sandy loam; common fine distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; very friable; medium acid; clear smooth boundary.

Bw3—29 to 33 inches; brown (10YR 5/3) fine sandy loam; common fine faint dark grayish brown (10YR 4/2) and common fine distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; very friable; medium acid; clear smooth boundary.

BC—33 to 42 inches; brown (10YR 5/3) loamy fine sand; common fine faint grayish brown (10YR 5/2) and few fine and medium distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; very friable; few fine dark concretions (oxides); medium acid; clear smooth boundary.

C1—42 to 55 inches; pale brown (10YR 6/3) fine sand; few medium distinct brown (7.5YR 4/4) mottles; single grained; loose; slightly acid; clear smooth boundary.

C2—55 to 60 inches; pale brown (10YR 6/3) sand; few fine distinct brown (7.5YR 4/4) mottles; single grained; loose; slightly acid.

The thickness of the solum ranges from 35 to 55 inches. The thickness of the mollic epipedon ranges from 10 to 16 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is strongly acid to neutral. It generally is loam, but the range includes clay loam. The Bw horizon has value of 4 or 5 and chroma of 2 to 4. It is medium acid or strongly acid. It is loam or clay loam in the upper part, but the content of clay decreases and the content of sand increases with increasing depth. In some pedons the lower part of the Bw horizon and the BC horizon are sandy loam, loamy sand, or sand. The C horizon generally is sand or fine sand, but the range includes loamy sand.

Snider series

The Snider series consists of somewhat poorly drained, moderately permeable soils on stream terraces. These soils formed in loamy and silty alluvium. The native vegetation was prairie grasses. The slope ranges from 0 to 2 percent.

The Snider soils commonly are adjacent to the Bertrand and Bolan soils. The adjacent soils generally are higher on the stream terraces than the Snider soils. Also, their B horizon has higher chroma. The surface layer of the Bertrand soils is lighter colored than that of the Snider soils. The Bolan soils contain more sand throughout the solum than the Snider soils.

Typical pedon of Snider loam, 0 to 2 percent slopes, in an area of cropland; 900 feet south and 1,300 feet east of the northwest corner of sec. 17, T. 71 N., R. 1 W.

Ap—0 to 9 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; weak very fine granular structure; friable; neutral; abrupt smooth boundary.

A—9 to 13 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; moderate very fine granular structure; friable; medium acid; clear smooth boundary.

AB—13 to 18 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; very dark brown (10YR 2/2) coatings on faces of peds; moderate very fine subangular blocky structure; friable; few fine brown (7.5YR 4/4) concretions (oxides); medium acid; clear smooth boundary.

Bw1—18 to 29 inches; dark grayish brown (10YR 4/2) loam; very dark grayish brown (10YR 3/2) coatings on faces of many peds; many fine prominent dark reddish brown (5YR 3/2) mottles; moderate very fine subangular blocky structure; friable; medium acid; clear smooth boundary.

Bw2—29 to 37 inches; dark grayish brown (10YR 4/2) loam; dark brown (10YR 3/3) coatings on faces of some peds; many fine prominent dark reddish brown (5YR 3/2) mottles; moderate fine subangular blocky structure; friable; medium acid; clear smooth boundary.

Bw3—37 to 45 inches; dark grayish brown (10YR 4/2) loam; many fine faint very dark grayish brown (10YR 3/2) and few fine distinct brown (7.5YR 4/4) mottles; moderate very fine subangular blocky structure; friable; medium acid; clear smooth boundary.

Bw4—45 to 54 inches; dark grayish brown (10YR 4/2) loam; common fine distinct brown (7.5YR 4/4) and few fine prominent dark reddish brown (5YR 3/4) mottles; moderate very fine subangular blocky structure; friable; few fine dark concretions (oxides); slightly acid; clear smooth boundary.

BC—54 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent reddish brown (5YR 4/4) and few medium prominent reddish brown (5YR 5/4) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; friable; few fine dark concretions (oxides); dark stains on faces of some peds; slightly acid.

The thickness of the solum ranges from 45 to more than 60 inches. The mollic epipedon is 10 to 20 inches thick.

The A horizon has value and chroma of 2 or 3. It is loam or silt loam. The Bw horizon has hue of 10YR or 2.5YR, value of 4 or 5, and chroma of 2. It is loam, silt loam, or silty clay loam, each of which has a high content of fine sand.

Sparta series

The Sparta series consists of excessively drained, rapidly permeable soils on stream benches. These soils formed in sandy alluvium which has been reworked by the wind in most places. The native vegetation was prairie grasses. The slope ranges from 0 to 7 percent.

The Sparta soils commonly are adjacent to the Dickinson soils in similar positions on the landscape. The well drained or somewhat excessively drained Dickinson soils contain more clay in the surface layer and the upper part of the B horizon than the Sparta soils.

Typical pedon of Sparta loamy fine sand, 2 to 7 percent slopes, in an area of cropland; 1,750 feet east and 230 feet north of the southwest corner of sec. 9, T. 72 N., R. 1 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) loamy fine sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; neutral; very friable; clear smooth boundary.

A1—8 to 16 inches; very dark brown (10YR 2/2) loamy fine sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; slightly acid; clear smooth boundary.

A2—16 to 22 inches; very dark grayish brown (10YR 3/2) sand, brown (10YR 4/3) dry; weak fine granular structure; very friable; slightly acid; clear smooth boundary.

BA—22 to 29 inches; brown (10YR 4/3) sand; dark brown (10YR 3/3) coatings on faces of some peds; weak fine granular structure; very friable; slightly acid; clear smooth boundary.

Bw—29 to 37 inches; dark yellowish brown (10YR 4/4) sand; weak fine granular structure; very friable; medium acid; clear smooth boundary.

BC1—37 to 42 inches; yellowish brown (10YR 5/6) sand; weak medium prismatic structure; very friable; medium acid; clear smooth boundary.

BC2—42 to 58 inches; brown (7.5YR 5/4) loamy fine sand; common fine faint strong brown (7.5YR 5/6) and few fine distinct strong brown (7.5YR 5/8) mottles; weak medium prismatic structure; very friable; sand and coarse sand at a depth of 56 to 58 inches; medium acid; clear smooth boundary.

C—58 to 60 inches; brown (7.5YR 4/4) loamy fine sand; few fine distinct yellowish red (5YR 4/6) mottles; single grained; very friable; medium acid.

The thickness of the solum ranges from 40 to 60 inches. The thickness of the mollic epipedon ranges from 16 to 24 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is medium acid to neutral. It is dominantly loamy fine sand, but the range includes loamy sand and sand. The B horizon has value of 4 or 5 and chroma of 3 to 6. It is slightly acid to strongly acid. It is dominantly sand, but the range includes loamy fine sand. The C horizon has value of 4 or 5 and chroma of 4 to 6. It is medium acid or strongly acid.

Sperry series

The Sperry series consists of very poorly drained or poorly drained, slowly permeable soils in slight depressions on broad upland divides. These soils formed in loess. The native vegetation was prairie grasses. The slope is 0 to 1 percent.

The Sperry soils are commonly adjacent to the nearly level Mahaska and Taintor soils on ridgetops. The adjacent soils do not have an E horizon. Their B2t horizon contains less clay than that of the Sperry soils.

Typical pedon of Sperry silt loam, 0 to 1 percent slopes, in an area of cropland; 70 feet north and 2,115 feet east of the southwest corner of sec. 15, T. 72 N., R. 4 W.

Ap1—0 to 6 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; mixed with some streaks and patches of dark gray (10YR 4/1) subsurface material; weak very fine granular structure; friable; slightly acid; clear smooth boundary.

Ap2—6 to 10 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; mixed with some streaks and patches of dark gray (10YR 4/1) subsurface material; weak fine and very fine granular structure; friable; slightly acid; abrupt smooth boundary.

E—10 to 14 inches; dark gray (10YR 4/1) silt loam, gray (10YR 5/1) dry; very dark gray (10YR 3/1) coatings on some horizontal cleavage planes; few fine prominent yellowish brown (10YR 5/4 and 5/6) and few fine faint dark gray (10YR 4/1) mottles; moderate medium platy structure; friable; light brownish gray (10YR 6/2) silt coatings on faces of peds when dry; medium acid; clear smooth boundary.

Btg1—14 to 19 inches; very dark gray (10YR 3/1) silty clay loam; black (10YR 2/1) coatings on some peds; common fine distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) and few fine faint dark gray (10YR 4/1) mottles; strong fine subangular blocky structure; friable; thin discontinuous clay films; light brownish gray (10YR 6/2) coatings on faces of most peds when dry; medium acid; clear smooth boundary.

Btg2—19 to 27 inches; dark gray (5Y 4/1) silty clay; very dark gray (10YR 3/1) coatings on faces of peds; common fine prominent yellowish brown (10YR 5/4) mottles; strong fine and medium subangular blocky structure; firm; thin continuous clay films; slightly acid; clear smooth boundary.

Btg3—27 to 34 inches; dark gray (5Y 4/1) silty clay; dark gray (10YR 4/1) and very dark gray (10YR 3/1) coatings on faces of some peds; common fine distinct yellowish brown (10YR 5/4) mottles; strong fine and medium subangular blocky structure; firm; thin nearly continuous clay films; slightly acid; clear smooth boundary.

Btg4—34 to 43 inches; dark grayish brown (2.5Y 4/2) silty clay loam; dark gray (10YR 4/1) and very dark gray (10YR 3/1) coatings on some peds; common fine distinct light olive brown (2.5Y 5/4) and few fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; strong fine and medium subangular blocky structure; firm; thin nearly continuous clay films; slightly acid; clear smooth boundary.

Btg5—43 to 49 inches; olive gray (5Y 5/2) silty clay loam; dark gray (5Y 4/1) coatings on some peds; few fine distinct yellowish brown (10YR 5/4) mottles; moderate fine and medium subangular blocky structure; friable; thin patchy clay films; slightly acid; clear smooth boundary.

BCg—49 to 60 inches; olive gray (5Y 5/2) silty clay loam; many fine prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; very dark gray (10YR 3/1) clay flows in root channels and on faces of prisms; slightly acid.

The thickness of the solum ranges from 48 to more than 60 inches. The mollic epipedon is 10 to 12 inches thick.

The A1 or Ap horizon has value of 2 or 3 and chroma of 1. The E horizon has value of 3 or 4 and chroma of 1 or 2. The Btg horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 5, and chroma of 1 or 2. It is silty clay loam or silty clay.

Taintor series

The Taintor series consists of poorly drained, moderately slowly permeable soils on ridgetops in the uplands. These soils formed in loess. The native vegetation was prairie grasses. The slope is 0 to 1 percent.

The Taintor soils are similar to the Haig and Kalona soils and commonly are adjacent to the Mahaska soils. The Haig and Kalona soils are in positions on the landscape similar to those of the Taintor soils. The B horizon of the Haig soils contains more clay than that of the Taintor soils. The A horizon of the Kalona soils contains more clay than that of the Taintor soils. The somewhat poorly drained Mahaska soils commonly are in downslope areas. Their B horizon has higher chroma than that of the Taintor soils.

Typical pedon of Taintor silty clay loam, 0 to 1 percent slopes, in an area of corn; 265 feet west and 70 feet south of the northeast corner of sec. 21, T. 72 N., R. 4 W.

Ap—0 to 8 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine granular structure; friable; few fine dark concretions (oxides); medium acid; abrupt smooth boundary.

A1—8 to 14 inches; black (N 2/0) silty clay loam, dark gray (10YR 4/1) dry; moderate very fine subangular blocky structure; friable; few fine dark concretions (oxides); medium acid; clear smooth boundary.

A2—14 to 19 inches; black (N 2/0) silty clay loam, dark gray (10YR 4/1) dry; few fine distinct grayish brown (2.5Y 5/2) and few fine distinct brown (7.5YR 4/4) mottles; moderate very fine subangular blocky structure; friable; few fine dark concretions (oxides); medium acid; clear smooth boundary.

AB—19 to 23 inches; black (10YR 2/1) silty clay loam; common fine distinct dark grayish brown (2.5Y 4/2) and few fine distinct brown (7.5YR 4/4) mottles; moderate fine and very fine subangular blocky structure; firm; few fine concretions (oxides); medium acid; clear smooth boundary.

Btg1—23 to 28 inches; dark grayish brown (2.5Y 4/2) silty clay loam; few very dark gray (10YR 3/1) coatings on faces of peds; common fine distinct brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; firm; thin continuous clay films; few fine dark concretions (oxides); slightly acid; clear smooth boundary.

Btg2—28 to 34 inches; dark grayish brown (2.5Y 4/2) silty clay loam; few very dark gray (10YR 3/1) coatings on faces of peds; common fine distinct strong brown (7.5YR 5/6) and many fine distinct brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; firm; thin discontinuous clay films; few fine concretions (oxides); slightly acid; clear smooth boundary.

Btg3—34 to 45 inches; olive gray (5Y 5/2) silty clay loam; very dark gray (10YR 3/1) coatings on faces of peds; common fine and medium strong brown (7.5YR 5/6) and few fine distinct olive brown (2.5Y 4/4) mottles; moderate fine and medium subangular blocky structure; friable; few fine dark concretions (oxides); slightly acid; clear smooth boundary.

Btg4—45 to 52 inches; olive gray (5Y 4/2) silty clay loam; few very dark gray (10YR 3/1) streaks on faces of peds; many fine and medium distinct strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure; friable; few fine dark concretions (oxides); slightly acid; clear smooth boundary.

Cg—52 to 60 inches; olive gray (5Y 5/2) silty clay loam; few fine distinct brown (7.5YR 4/4) mottles; massive; friable; neutral.

The thickness of the solum ranges from 45 to more than 60 inches. The thickness of the mollic epipedon ranges from 16 to 24 inches.

The A horizon has value of 2 and chroma of 0 or 1. It is slightly acid or medium acid. The Btg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2. It is silty clay loam or silty clay. It is slightly acid or medium acid. The C horizon has value of 4 or 5 and chroma of 2.

Titus series

The Titus series consists of poorly drained, moderately slowly permeable soils on flood plains. These soils formed in silty alluvium. The native vegetation was prairie grasses. The slope ranges from 0 to 2 percent.

The Titus soils are similar to the Zook soils and commonly are adjacent to the Wabash and Zook soils in similar positions on the landscape. The Wabash soils contain more clay throughout than the Titus soils. The mollic epipedon of the Wabash and Zook soils is thicker than that of the Titus soils.

Typical pedon of Titus silty clay loam, 0 to 2 percent slopes, in an area of cropland; 2,020 feet south and 1,980 feet west of the northeast corner of sec. 4, T. 72 N., R. 1 W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; firm; neutral; abrupt smooth boundary.

A1—8 to 14 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; few fine faint dark gray (10YR 4/1) and few fine distinct brown (7.5YR 4/4) mottles; moderate very fine subangular blocky structure; firm; few dark concretions (oxides); slightly acid; clear smooth boundary.

A2—14 to 22 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; few fine faint dark gray (10YR 4/1), few fine prominent brown (7.5YR 4/4), and few fine prominent strong brown (7.5YR 5/6) mottles; moderate very fine subangular and angular blocky structure; firm; few dark concretions (oxides); slightly acid; gradual smooth boundary.

Bg1—22 to 28 inches; dark gray (5Y 4/1) silty clay loam; very dark gray (10YR 3/1) coatings on faces of peds; common fine distinct brown (7.5YR 4/4) mottles; moderate very fine subangular blocky structure; firm; few fine dark concretions (oxides); slightly acid; gradual smooth boundary.

Bg2—28 to 34 inches; dark gray (5Y 4/1) silty clay loam; very dark gray (10YR 3/1) coatings on faces of peds; common fine distinct brown (7.5YR 4/4) mottles; moderate very fine and fine subangular and angular blocky structure; firm; few fine dark concretions (oxides); slightly acid; gradual smooth boundary.

Bg3—34 to 42 inches; dark gray (5Y 4/1) silty clay loam; very dark gray (10YR 3/1) coatings on faces of peds; common fine distinct brown (7.5YR 4/4) mottles; moderate fine subangular and angular blocky structure; firm; few fine dark concretions (oxides); slightly acid; gradual smooth boundary.

BCg1—42 to 48 inches; dark gray (5Y 4/1) silty clay loam; many fine distinct strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular and angular blocky structure; firm; few fine dark concretions (oxides); slightly acid; gradual smooth boundary.

BCg2—48 to 60 inches; dark gray (5Y 4/1) silty clay loam; many fine distinct strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure; firm; slightly acid.

The thickness of the solum ranges from 45 to more than 60 inches. The thickness of the mollic epipedon ranges from 12 to 24 inches.

The A horizon has value of 2 or 3 and chroma of 1. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1. It is slightly acid or neutral.

Tuskeego series

The Tuskeego series consists of poorly drained, very slowly permeable soils in nearly level to slightly depressional areas on bottom land and concave foot slopes. These soils formed in silty and clayey alluvial sediments. The native vegetation was mixed prairie grasses and deciduous trees. The slope ranges from 1 to 3 percent.

The Tuskeego soils commonly are adjacent to the Colo, Okaw, and Vesser soils. The Colo and Vesser soils are on flood plains and foot slopes and commonly are downslope from the Tuskeego soils. The Colo soils do not have an E or argillic horizon. They have a thick mollic epipedon. The Okaw soils are on stream terraces and commonly are lower on the landscape than the Tuskeego soils. Also, their surface layer is lighter colored. The B horizon of the Vesser soils contains less clay than that of the Tuskeego soils.

Typical pedon of Tuskeego silt loam, 1 to 3 percent slopes, in an area of cropland; 750 feet west and 975 feet south of the northeast corner of sec. 26, T. 71 N., R. 4 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) silt loam, brown (10YR 5/3) dry; mixed with some streaks and patches of dark grayish brown (10YR 4/2) subsurface material; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak very fine granular structure; friable; slightly acid; abrupt smooth boundary.

E1—8 to 13 inches; dark gray (10YR 4/1) silt loam, light brownish gray (10YR 6/2) dry; very dark gray (10YR 3/1) coatings on faces of some plates; few fine faint dark grayish brown (10YR 4/2) and common fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak medium platy structure parting to weak very fine subangular blocky; friable; medium acid; clear smooth boundary.

E2—13 to 18 inches; dark gray (10YR 4/1) silt loam; dark grayish brown (10YR 4/2) coatings on faces of some plates; common fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak medium platy structure parting to weak fine subangular blocky; friable; common fine dark concretions (oxides); strongly acid; clear smooth boundary.

Btg1—18 to 22 inches; dark gray (10YR 4/1) silty clay loam; very dark gray (10YR 3/1) coatings on faces of some peds; common fine distinct brown (7.5YR 5/4) and strong brown (7.5YR 5/6) mottles; moderate very fine subangular blocky structure; firm; thin continuous clay films on peds; light gray (10YR 6/1) silt coatings on faces of peds when dry; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

Btg2—22 to 28 inches; dark gray (10YR 4/1) silty clay loam; very dark gray (10YR 3/1) coatings on faces of some peds; common fine distinct reddish brown (5YR 4/4) mottles; moderate fine subangular blocky structure; firm; thin continuous clay films on peds; light brownish gray (10YR 6/2) silt coatings on faces of peds when dry; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

Btg3—28 to 33 inches; dark gray (10YR 4/1) silty clay loam; very dark gray (10YR 3/1) coatings on faces of some peds and in root channels; few fine faint gray (10YR 5/1) and common fine distinct yellowish brown (10YR 5/4) and brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; firm; thin continuous clay films; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

Btg4—33 to 42 inches; dark gray (10YR 4/1) silty clay loam; very dark gray (10YR 3/1) coatings on faces of some peds and in root channels; many fine distinct brown (7.5YR 4/4) and strong brown (7.5YR 5/6) and few fine faint gray (10YR 5/1) mottles; moderate fine and medium subangular blocky structure; firm; thin nearly continuous clay films; common fine dark concretions (oxides); medium acid; gradual smooth boundary.

Btg5—42 to 53 inches; grayish brown (10YR 5/2) silty clay loam; very dark gray (10YR 3/1) coatings on faces of some peds and in root channels; common fine faint gray (10YR 5/1), many fine distinct strong brown (7.5YR 5/6), and common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate fine and medium subangular blocky structure; firm; thin patchy clay films; few fine dark concretions (oxides); medium acid; clear smooth boundary.

BCg—53 to 60 inches; dark grayish brown (10YR 4/2) silty clay loam; very dark gray (10YR 3/1) coatings on faces of some peds and in root channels; many fine prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; slightly acid.

The thickness of the solum ranges from 48 to 60 or more inches. The surface layer is 6 to 10 inches thick.

The A horizon has value of 2 and chroma of 1 or 2. It is strongly acid to neutral. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. The content of clay in this horizon ranges from 38 to 48 percent.

Vesser series

The Vesser series consists of somewhat poorly drained or poorly drained, moderately permeable soils in the higher areas on bottom land and on foot slopes and alluvial fans. These soils formed in silty alluvium. The native vegetation was water-tolerant prairie grasses. The slope ranges from 0 to 2 percent.

The Vesser soils are similar to the Coppock soils and commonly are adjacent to the Colo, Lawson, and Nodaway soils in downslope areas on alluvial fans or flood plains. The mollic epipedon of the Colo and Lawson soils is thicker than that of the Vesser soils. The Coppock soils do not have a mollic epipedon. The Nodaway soils contain less clay in the control section than the Vesser soils. They do not have a B horizon.

Typical pedon of Vesser silt loam, 0 to 2 percent slopes, in an area of cropland; 3,090 feet west and 250 feet south of the northeast corner of sec. 25, T. 72 N., R. 2 W.

Ap—0 to 7 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; mixed with some streaks and patches of dark grayish brown (10YR 4/2) subsurface material; weak very fine granular structure; friable; medium acid; clear smooth boundary.

A—7 to 13 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; few fine distinct dark reddish brown (5YR 3/2) mottles; weak medium platy structure parting to moderate very fine granular; friable; medium acid; clear smooth boundary.

E—13 to 25 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; very dark grayish brown (10YR 3/2) coatings on faces of peds; common fine prominent brown (7.5YR 4/4) mottles; weak medium platy structure; friable; few fine dark concretions (oxides); medium acid; clear smooth boundary.

Btg1—25 to 27 inches; dark grayish brown (10YR 4/2) silty clay loam; very dark grayish brown (10YR 3/2) coatings on faces of peds; many fine prominent dark yellowish brown (10YR 4/4) mottles; moderate fine subangular blocky structure; friable; few dark reddish brown (5YR 2/2) stains on faces of some peds; thin nearly continuous clay films; pale brown (10YR 6/3) sand and silt coatings on faces of some peds when dry; few fine dark concretions (oxides); medium acid; clear smooth boundary.

Btg2—27 to 35 inches; dark grayish brown (10YR 4/2) silty clay loam; very dark grayish brown (10YR 3/2) coatings on faces of some peds; many fine and medium prominent dark yellowish brown (10YR 4/4) mottles; moderate fine subangular blocky structure; friable; some dark reddish brown (5YR 2/2) stains on faces of some peds; thin nearly continuous clay films; pale brown (10YR 6/3) sand and silt coatings on faces of peds when dry; few fine dark concretions (oxides); medium acid; clear smooth boundary.

Btg3—35 to 46 inches; dark grayish brown (10YR 4/2) silty clay loam; many fine and medium prominent dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; very dark grayish brown (10YR 3/2) stains on faces of some peds and in root channels; thin nearly continuous clay films; few fine dark concretions (oxides); medium acid; clear smooth boundary.

Btg4—46 to 58 inches; mottled yellowish brown (10YR 5/6) and dark grayish brown (10YR 4/2) silty clay loam; weak medium prismatic structure parting to moderate fine subangular blocky; friable; very dark grayish brown (10YR 3/2) stains on faces of some peds and in root channels; thin patchy clay films on faces of prisms and in root channels; few fine dark concretions (oxides); medium acid; clear smooth boundary.

BCg—58 to 60 inches; mottled yellowish brown (10YR 5/6) and dark grayish brown (10YR 4/2) silty clay loam; weak medium prismatic structure; friable; very dark grayish brown (10YR 3/2) stains on faces of some prisms; few fine dark concretions (oxides); slightly acid.

The thickness of the solum ranges from 50 to more than 60 inches. The thickness of the mollic epipedon ranges from 12 to 20 inches.

The Ap or A horizon has value of 2 or 3 and chroma of 1 or 2. It is silt loam or silty clay loam. It is medium acid or slightly acid unless limed. The E horizon has value of 4 or 5 and chroma of 1 or 2. It is strongly acid or medium acid. The Btg horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 to 6. It is medium acid or slightly acid.

Wabash series

The Wabash series consists of very poorly drained, very slowly permeable soils on flood plains. These soils formed in clayey alluvium. The native vegetation was water-tolerant prairie grasses. The slope ranges from 0 to 2 percent.

The Wabash soils are similar to the Zook soils and commonly are adjacent to those soils. The Zook soils contain less clay and more silt than the Wabash soils.

Typical pedon of Wabash silty clay, 0 to 2 percent slopes, in an area of cropland; 860 feet east and 125 feet south of the northwest corner of sec. 20, T. 72 N., R. 1 W.

Ap—0 to 7 inches; black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; moderate very fine granular structure; firm; medium acid; abrupt smooth boundary.

A—7 to 18 inches; black (10YR 2/1) silty clay, very dark gray (10YR 3/1) dry; strong very fine and fine angular blocky structure; firm; neutral; diffuse smooth boundary.

BA—18 to 28 inches; black (5Y 2/1) silty clay, dark gray (10YR 4/1) dry; few fine prominent brown (7.5YR 4/4) and few fine faint dark gray (5Y 4/1) mottles; strong fine and medium angular blocky structure; very firm; neutral; diffuse smooth boundary.

Bg—28 to 42 inches; very dark gray (5Y 3/1) silty clay, dark gray (10YR 4/1) dry; common fine prominent brown (7.5YR 4/4) and few fine faint dark gray (5Y 4/1) mottles; strong fine and medium subangular blocky structure; very firm; neutral; clear smooth boundary.

BCg1—42 to 57 inches; dark gray (5Y 4/1) silty clay; common fine distinct brown (7.5YR 4/4) and common medium and coarse prominent yellowish red (5YR 4/8) mottles; weak medium prismatic structure; firm; dark concretions (oxides) 1 to 2 inches in diameter; neutral; clear smooth boundary.

BCg2—57 to 60 inches; dark gray (10YR 4/1) and dark grayish brown (10YR 4/2) silty clay; common fine prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; firm; few fine dark concretions (oxides); neutral.

The thickness of the solum ranges from 40 to 60 inches or more. The thickness of the A horizon ranges from 18 to 28 inches.

The A horizon has hue of 10YR, 2.5Y, or 5Y, value of 2 or 3, and chroma of 2 or less. It is medium acid to neutral. It is dominantly silty clay, but the range includes silty clay loam. The BAg, Bg, and BCg horizons have hue of 10YR, 2.5Y, or 5Y, value of 2 to 5, and chroma of 2 or less. They are slightly acid or neutral. They are silty clay or clay in which the content of clay ranges from 46 to 60 percent.

Weller series

The Weller series consists of moderately well drained, slowly permeable soils on the narrow tops and upper sides of ridges on upland divides. These soils formed in loess. The native vegetation was deciduous trees. The slope ranges from 2 to 9 percent.

The Weller soils are similar to the Clinton soils and commonly are adjacent to the Belinda and Pershing soils. The poorly drained Belinda soils are less sloping than the Weller soils and are higher on the landscape. Also, their B horizon is grayer. The Clinton soils contain less clay in the B horizon than the Weller soils. The Pershing soils are in positions on the landscape similar to those of the Weller soils. Their A1 or Ap horizon is darker or thicker than that of the Weller soils.

Typical pedon of Weller silt loam, 2 to 5 percent slopes, in a cultivated field; 1,240 feet west and 825 feet north of the center of sec. 6, T. 69 N., R. 4 W.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; mixed with some streaks and patches of brown (10YR 5/3) subsurface material; weak very fine granular structure; friable; medium acid; abrupt smooth boundary.

E—5 to 9 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; few fine distinct yellowish brown (10YR 5/4) mottles; moderate medium platy structure; friable; few fine dark oxides; medium acid; clear smooth boundary.

Bt1—9 to 13 inches; yellowish brown (10YR 5/4) silty clay loam; brown (10YR 5/3) coatings on faces of peds; few fine distinct yellowish brown (10YR 5/8) mottles; moderate fine angular blocky structure; firm; very thin continuous clay films; very pale brown (10YR 7/3) silt coatings on faces of peds; few fine dark oxides; strongly acid; clear smooth boundary.

Bt2—13 to 20 inches; yellowish brown (10YR 5/4) silty clay; few fine distinct strong brown (7.5YR 5/6) and few fine faint grayish brown (10YR 5/2) mottles; moderate fine angular and subangular blocky structure; firm; very thin continuous clay films on faces of peds; very pale brown (10YR 7/3) silt coatings on faces of peds; few fine dark oxides; strongly acid; gradual smooth boundary.

Bt3—20 to 25 inches; yellowish brown (10YR 5/4) silty clay; few fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) and few fine faint grayish brown (10YR 5/2) mottles; moderate fine angular and subangular blocky structure; firm; very thin nearly continuous clay films on faces of peds; few fine dark oxides; strongly acid; clear smooth boundary.

Bt4—25 to 33 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint grayish brown (10YR 5/2), few fine distinct yellowish brown (10YR 5/6), and few fine prominent strong brown (7.5YR 5/6) mottles; moderate fine angular and subangular blocky structure; firm; very thin nearly continuous clay films on faces of peds; few fine dark oxides; few dark reddish brown (5YR 2/2) stains on vertical faces of peds; strongly acid; gradual smooth boundary.

Bt5—33 to 39 inches; yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and few fine distinct strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; firm; very thin nearly continuous clay films on faces of peds; few fine dark oxides; few dark reddish brown (5YR 2/2) stains on vertical faces of peds; medium acid; clear smooth boundary.

Bt6—39 to 54 inches; brown (10YR 5/3) and grayish brown (10YR 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and few fine distinct strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure; firm; very thin patchy clay films on vertical faces of prisms; few fine dark oxides; few dark reddish brown (5YR 2/2) stains on vertical faces of peds; medium acid; gradual smooth boundary.

BC—54 to 60 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and few fine distinct strong brown (7.5YR 5/8) mottles; weak medium prismatic structure; firm; few fine dark oxides; medium acid.

The thickness of the solum ranges from 60 to 80 inches. The surface layer is 2 to 8 inches thick.

The Ap horizon has chroma of 1 to 3. The E horizon has value of 4 or 5 and chroma of 2 or 3. The Bt horizon has hue of 10YR and value of 4 or 5. It has some grayer mottles in the middle and lower parts.

Zook series

The Zook series consists of poorly drained, slowly permeable soils on flood plains. These soils formed in silty and clayey alluvium. The native vegetation was prairie grasses. The slope ranges from 0 to 2 percent.

The Zook soils are similar to the Titus and Wabash soils and commonly are adjacent to the Wabash soils in similar positions on the landscape. The Titus soils are not so dark below a depth of 24 inches as the Zook soils. The solum of the Wabash soils contains more clay throughout than that of the Zook soils.

Typical pedon of Zook silty clay loam, 0 to 2 percent slopes, in an area of cropland; 1,280 feet west and 160 feet north of the southeast corner of sec. 8, T. 72 N., R. 1 W.

Ap—0 to 5 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; firm; neutral; abrupt smooth boundary.

A1—5 to 18 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; few fine faint dark yellowish brown (10YR 4/4) mottles in the lower part; moderate very fine subangular blocky structure; firm; neutral; gradual smooth boundary.

A2—18 to 26 inches; black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; few fine faint dark grayish brown (2.5Y 4/2) and few fine distinct yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; firm; neutral; gradual smooth boundary.

A3—26 to 38 inches; black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; few fine faint dark gray (5Y 4/1) and few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate fine and medium subangular blocky structure; firm; neutral; gradual smooth boundary.

Bg1—38 to 45 inches; mottled gray (5Y 5/1) and olive gray (5Y 5/2) silty clay loam; dark grayish brown (10YR 4/2) coatings on faces of some peds; moderate fine and medium subangular blocky structure; firm; neutral; clear smooth boundary.

Bg2—45 to 52 inches; dark gray (5Y 4/1) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common dark reddish brown (5YR 2/2) concretions (oxides); neutral; clear smooth boundary.

Bg3—52 to 60 inches; gray (5Y 5/1) and olive gray (5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; friable; neutral.

The thickness of the solum ranges from 36 to 64 inches. The thickness of the mollic epipedon ranges from 36 to 50 inches. The thickness of the A horizon ranges from 26 to 40 inches.

The A horizon has value of 2 or 3 and chroma of 1 or less. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 5, and chroma of 2 or less. It is silty clay or silty clay loam in which the content of clay ranges from 38 to 46 percent. It is neutral or slightly acid.

formation of the soils

George R. Hallberg, chief, Geological Studies, Iowa Geological Survey, helped prepare this section.

This section describes the factors of soil formation and relates them to the soils in Des Moines County. It also describes the processes of soil formation. Detailed descriptions of the profiles considered representative of the series are given in the section "Soil series and their morphology."

factors of soil formation

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the vegetation under which the soil formed, the relief, and the length of time that the forces of soil formation have acted on the soil material (*5*). Human activities also affect soil formation.

Climate and vegetation are the active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and rock material and slowly change it into a natural body that has genetically related horizons. The effects of climate and vegetation are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil. A long period generally is needed for the formation of distinct horizons. The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the others.

parent material

The soils in Des Moines County formed in various kinds of geologic material. Listed in the order of their influence on the soils of the county, these are loess, glacial till, alluvium, material weathered from limestone bedrock, and eolian sand. In Des Moines County the various geologic depositions and subsequent erosion by streams resulted in the formation of a landscape characterized by broad, stable ridgetops. Soils formed in loess are on these ridgetops. The gently sloping to very steep soils on side slopes formed in loess, glacial till, and material weathered from limestone (fig. 18). The soils on the bottom land along the Mississippi River and in the other large and small stream and river valleys formed in alluvium.

Loess is silty wind-deposited material that consists largely of silt particles and smaller amounts of clay and sand. It is the most extensive parent material in the county. It was deposited during the Wisconsin glacial period about 29,000 to 14,000 years ago (*4*). The wind probably carried much of the loess from the flood plain along the Missouri River in the western part of Iowa, from the flood plain along the Mississippi River, and from areas along smaller rivers to the uplands. The thickness of the loess and the content of clay in the loess are related to the distance from the source of the loess.

In Des Moines County the loess is as much as 15 feet thick on the bluffs near the valley of the Mississippi River and thins out from the valley to the west. In much of the county it is about 8 to 10 feet thick on the nearly level stable divides. It is thinner on the side slopes, and on the lower parts of the side slopes, glacial till is exposed. The Clinton, Mahaska, and Taintor soils formed in loess.

Glacial till probably was deposited in Des Moines County during three glacial periods—the Nebraskan, then the Kansan, and then the Illinoian (*10*). The Nebraskan deposits probably covered the entire county. They were buried and possibly mixed with the later Kansan glacial till (*6*). The Kansan glacial till also covered the entire county. It is evident in some road cuts. In many places the Lindley soils formed in Kansan glacial till, particularly on the lower parts of slopes. In many places the Kansan till is capped by a very slowly permeable, gray, clayey paleosol. As a result, wet, seepy spots may occur in the part of the steeper Lindley soils below the paleosol. The paleosol, or ancient soil, formed on the level surface of the Kansan glacial till during the Yarmouth interglacial period, the time between the Kansan and Illinoian glacial periods.

A paleosol of Yarmouth and Sangamonian ages formed in the glacial deposits. In some areas it is gray and clayey. The Clarinda, Rinda, and Ashgrove soils formed in this material and the overlying loess. A reddish brown, clay loam paleosol formed in other areas. The Keswick soils formed in this material.

The Nebraskan and Kansan glaciers moved into Des Moines County from the north and west. The Illinoian glacier moved into the county from the east. It covered all of the county, except for about 16 sections in the

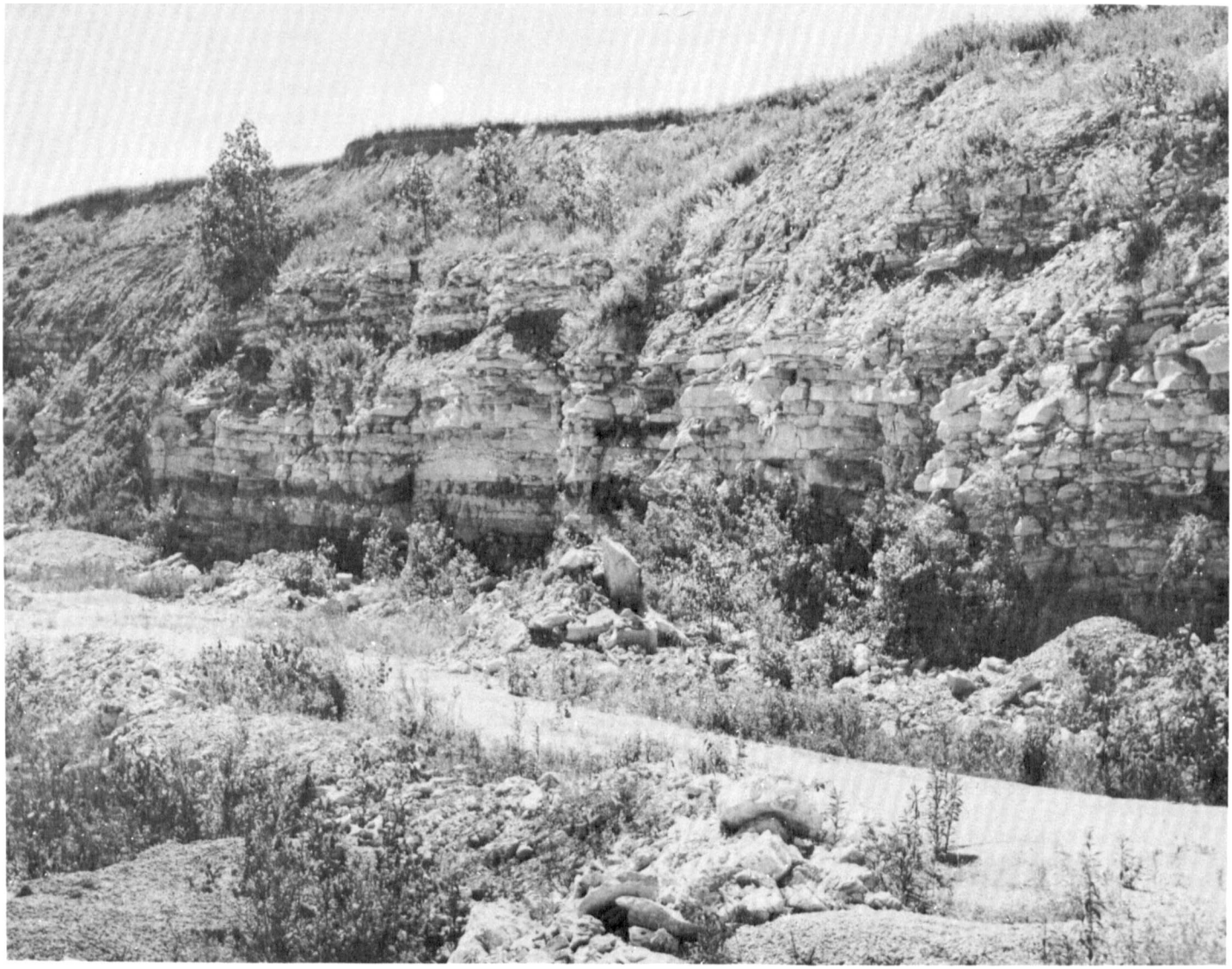


Figure 18.—Limestone bedrock and the overlying glacial till and loess in a limestone quarry wall.

northwest corner. The western edge of the Illinoian glacial till probably is the low ridge that is oriented northeast to southwest in the northwestern part of the county.

The little altered Kansan glacial till generally is firm loam. The content of clay is about 22 to 24 percent, that of sand 40 to 45 percent, and that of silt 31 to 36 percent. The lower part of the Illinoian glacial till typically is friable loam. The content of clay is about the same as that of the Kansan till, but the content of silt is about 40 to 45 percent and that of sand 31 to 36 percent. The upper part of the Illinoian till, which does not occur in places, varies greatly in texture. It has a low density and generally is stratified, including lenses of sorted silt, sand, and gravel. It generally is loose or soft because of the low density and strength and is not so consolidated as the lower unstratified Illinoian till. It ranges from a few to about 10 feet in thickness under most of the divides in the county but is thicker under the ridge near Yarmouth. The Illinoian deposits generally contain abundant fragments of coal, which are rare in the Kansan till. Also, they have more illite and less smectite clay minerals than the underlying Kansan deposits.

Alluvium is sediment deposited by water along the major and minor streams and rivers and on benches. The texture of the alluvium varies widely because the

sources of the material and the manner in which it was deposited differ from area to area. In Des Moines County the main sources are loess, till, and sediment deposited by the Mississippi River.

Some alluvial material, called local alluvium, has been transported only a short distance. Soils that formed in local alluvium are at the base of the steeper slopes. The Cantril and Olmitz Variant soils are examples.

As rivers and streams overflow their channels, alluvium is deposited. The coarser or larger particles generally are deposited closer to the stream channel or in and along the main path of the floodwater. The finer particles are deposited in the areas farther away from the stream channel, where the floodwater moves slowly or is still. The Nodaway soils formed in recent stratified silty alluvium. The alluvium in which the Lawson soils formed is darker and slightly finer textured than that in which the Nodaway soils formed. Also, it generally is farther from the stream channel.

The soils on bottom land and benches along the Mississippi River formed in alluvium. In these areas the depth to underlying sandy alluvium varies but generally is less than 20 feet. The texture of the alluvium varies widely. The Wabash and Zook soils formed in fine textured alluvium. The Ackmore soils formed in alluvium that is not so fine textured. The Bolan, Vesser, Coppock, and Bertrand soils formed in medium textured and moderately fine textured alluvium on low benches. The soils along the Mississippi River are in a very complex pattern because the current varied when the material was deposited. Some of the low areas are old channels or lakes that have been drained. They are subject to flooding unless they are protected by a levee along the Mississippi River or unless diversion ditches carry the water from the larger upland drains to the river.

On small terraces along the Mississippi and Skunk Rivers, some soils formed in red, pink, or gray clayey alluvium underlain by stratified sand or gravel at a depth of 3 to 10 feet or more. The Niota Variant soils are an example.

Limestone bedrock is the oldest parent material in Des Moines County. It is at or near the surface in scattered areas throughout the county, generally near the base of the steeper slopes. It is at a depth of 5 to 20 inches in the Nordness soils. In this county the limestone is interbedded with shale in some areas, as is evident in quarries and some road cuts.

Eolian, or wind-deposited, sand is dominantly fine quartz sand. In Des Moines County it generally is on stream benches. The material may have been partly deposited by water, but the top 2 or 3 feet has been reworked by wind. The Dickinson and Sparta soils formed in this material.

climate

The soils in Des Moines County formed under the influence of a midcontinental, subhumid climate for at least 3,000 years (*9, 11*). Between 30,000 and 11,000 years ago, a cooler, moist climate favored the growth of coniferous forest vegetation. As the climate warmed, deciduous forest invaded and persisted until about 9,000 years ago. Since that time the climate has been characterized by further warming and greater dryness. Under these climatic conditions, the dominant vegetation has been mixed prairie grasses and deciduous forest.

The general climate has had an important overall influence on the characteristics of the soils but has not caused major differences among them. The influence of the general climate in a region is modified by local conditions. For example, soils on south-facing slopes formed under a microclimate that is warmer and drier than that of the soils in nearby areas. Also, the low lying, poorly drained soils on bottom land formed under a microclimate that is wetter and colder than that of most of the surrounding soils. The local conditions account for some of the differences among the soils in the county.

Changes in temperature activate the weathering of the parent material by water and air. As the parent material weathers, changes caused by physical and chemical actions take place. Rainfall affects the amount of leaching in the soil and the kinds of plants on the soil. Temperature and other climatic factors indirectly affect soil formation through their effect on the plant and animal life on and in the soil.

vegetation

Many changes in the climate and vegetation took place in Iowa during the postglacial period (*9*). Forests dominated by spruce grew on the soils until about 11,000 years ago. They were replaced by deciduous forest, which was dominant until about 9,000 years ago. Then, prairie grasses began to dominate Iowa. For the past 8,000 years, the soils of Des Moines County probably have been influenced by the prairie grasses and deciduous trees. Big bluestem and little bluestem were the main prairie grasses. Oak, hickory, ash, elm, and maple were the main trees.

The vegetation probably changed while soils formed in areas bordering trees and grasses. The morphology of the Gara, Givin, and Ladoga soils reflects the influence of both trees and grasses. The Clinton, Keomah, and Lindley soils formed under the influence of trees (*8*). The Mahaska, Otley, Taintor, Wabash, and Zook soils formed under grasses.

The soils that formed under trees generally have a lighter colored, thinner surface layer than those that formed under grasses. Also, they are more acid and have a lower content of organic matter. The soils that formed under mixed grasses and trees have properties that are intermediate between the properties of soils that formed only under grasses and those that formed only under trees.

relief

Relief affects the formation of soils mainly through its effect on drainage, runoff, the depth to the water table, and potential erosion. The soils in Des Moines County range from nearly level to very steep.

A difference in slope is the main reason for the differing properties among some of the soils in the county. The influence of relief is evident in the color, the thickness of the solum, and the development of horizons. The Taintor and Otley soils formed in loess under similar vegetation, but they are in different positions on the landscape. The nearly level, poorly drained Taintor soils are in areas where the water runs off slowly. The gently sloping and moderately sloping, moderately well drained Otley soils are in areas where some of the rainfall runs off the surface. Water that does not run off percolates through the soils, evaporates, or is used by plants. The water that percolates through the Taintor soils causes a high water table during part of the year. The high water table results in a grayish color in the subsoil. The Otley soils, which do not have a seasonal high water table, have a browner subsoil.

The slope affects runoff and the amount of moisture available to plants. The lack of moisture restricts the growth of some types of vegetation and as a result may also affect the content of organic matter.

time

The length of time that the soil material is acted on by soil-forming processes affects the kind of soil that forms. The older soils have strongly expressed genetic horizons. The younger soils have only weakly expressed horizons. Some soils on flood plains show little or no evidence of soil formation because they have not been in place long enough for distinct horizons to develop. The Nodaway soils are an example.

An older soil generally has a higher content of clay in the subsoil than a younger soil forming in a similar parent material. As a soil forms, clay is moved from the surface layer to the subsoil. This transfer increases the content of clay in the subsoil. It is more evident in a nearly level soil than in a more sloping soil. In the more sloping soil, material may be removed from the surface by erosion before a thick profile forms. The Lindley and Gara soils are examples.

human activities

Important changes take place in the soil after it is cultivated. Changes caused by water erosion generally are the most significant. On many of the cultivated soils in the county, particularly on the gently rolling and strongly sloping ones, part of the original surface layer has been lost through sheet erosion.

In many intensively cultivated areas, the granular structure that was apparent when the grassland was undisturbed is no longer evident. In these areas the surface layer tends to bake and harden when it dries. Fine textured soils that have been plowed when too wet tend to puddle and have a slower rate of infiltration than similar soils in undisturbed areas.

Management practices have increased the productivity of some soils and reclaimed areas that are otherwise not suitable for crops. Drainage ditches and diversions, dikes, and levees have made large areas of bottom land suitable for cultivation. A drainage system has greatly improved the suitability of broad areas of the nearly level Taintor and Kalona soils for cultivation. Applications of commercial fertilizer have counteracted deficiencies in plant nutrients. As a result of these applications, some soils are more productive than they were in their natural state.

processes of horizon development

Horizon differentiation is the result of four basic processes. These are additions, removals, transfers, and transformations (*12*). Each of these affects many substances in the soils, such as organic matter, soluble salts, carbonates, iron oxides, and clay minerals. The changes brought about by these processes help to determine the ultimate nature of the soil profile.

The accumulation of organic matter is an early phase in the formation of most soils. The content of organic matter ranges from high to very low in the A horizon of the soils in Des Moines County. It is low in the thin A horizon of the Clinton soils and high in the thick A horizon of the Zook and Colo soils. In some soils it is low because erosion has removed part of the A horizon.

The removal of substances from parts of the profile is important in the development of soil horizons in Des Moines County. The downward movement of calcium carbonates and bases is an example. Free carbonates have been leached from the upper part of nearly all of the soils in the county. Exceptions are some very young alluvial soils. Some soils are so strongly leached that they are strongly acid or very strongly acid in the subsoil.

A number of transfers from one horizon to another are evident in the soils of the county. Phosphorus, for example, is removed from the subsoil by plant roots and transferred to the parts of the plant growing above the ground. It is then returned to the surface layer in the plant residue. This process affects the form and distribution of the phosphorus in the profile.

The translocation of silicate clay minerals has an important effect on horizon development. The clay minerals are carried downward in suspension by percolating water from the A horizon. They accumulate in the B horizon as fillings in pores and root channels and as clay films on the faces of peds. This process has affected many of the soils in the county. In other soils, the clay content of the A horizon is not markedly different from that of the B horizon and other evidence of clay movement is minimal.

Another kind of transfer occurs only in very clayey soils. Cracks form when these soils shrink and swell. As a result, some of the material from the surface layer is transferred to the lower parts of the profile. This kind of transfer can occur in the Wabash and Clarinda soils.

Transformations are physical and chemical. The weathering of soil particles to smaller sizes by freezing and thawing is an example of a physical transformation. The reduction of iron is an example of a chemical transformation. This process is called gleying. It occurs when the soil is saturated for long periods. It is evidenced by ferrous iron and gray colors in the soil. It is a characteristic of poorly drained soils, such as the Taintor soils. Reductive extractable iron, or free iron, generally is not so evident in somewhat poorly drained soils, such as the Mahaska soils (*15*).

references

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. l0, 2 vols., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Benton, T. H., and E. D. Lowe. 1925. Soil survey of Des Moines County, Iowa. U.S. Dep. Agric., Bur. Soils, 34 pp., illus.

(4) Hutton, Curtis E. 1947. Studies of loess-derived soils in southwestern Iowa. Soil Sci. Soc. Am. Proc. 12: 424-431; illus.

(5) Jenny, Hans. 1941. Factors of soil formation. McGraw-Hill Book Company, Inc., 281 pp., illus.

(6) Kay, George F., and Jack B. Graham. 1943. The Illinoian and post-Illinoian Pleistocene geology of Iowa. Iowa Geol. Surv. Annu. Rep. 38: 262 pp., illus.

(7) Portland Cement Association. 1962. PCA soil primer. 52 pp., illus.

(8) Prill, R. C., and F. F. Riecken. 1958. Variation in forest-derived soils from Kansan till in southern and southeastern Iowa. Soil Sci. Soc. Am. Proc. 22: 70-75.

(9) Ruhe, Robert V. 1956. Geomorphic surfaces and the nature of soils. Soil Sci. 82: 441-445, illus.

(10) Ruhe, Robert V. 1969. Quaternary landscapes in Iowa. Iowa State Univ. Press, 255 pp., illus.

(11) Ruhe, R. V., Meyer Rubin, and W. H. Scholtes. 1957. Late Pleistocene radiocarbon chronology in Iowa. Am. J. Sci. 255: 671-689.

(12) Simonson, Roy W. 1959. Outline of a generalized theory of soil genesis. Soil Sci. Soc. Am. Proc. 23: 152-156, illus.

(13) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus.

(14) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.

(15) United States Department of Agriculture. 1966. Soil survey laboratory data and descriptions for some soils of Iowa. Soil Conserv. Serv., Soil Surv. Invest. Rep. No. 3, 181 pp.

(16) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

glossary

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Bedding. Draining the soil through a series of broad beds made by plowing, grading, or otherwise elevating the surface of a flat field.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the removal of water from the soil. Drainage classes are determined on the basis of an overall evaluation of water removal as influenced by climate, slope, and position on the landscape. Precipitation, runoff, amount of moisture infiltrating the soil, and rate of water movement through the soil affect the degree and duration of wetness. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow, very porous, or steep, or a combination of these.

Somewhat excessively drained.—Water is removed from the soil rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow or moderately deep, very porous, or steep, or a combination of these.

Well drained.—Water is removed from the soil so readily that the upper 40 inches generally does not have the mottles or dull colors related to wetness.

Moderately well drained.—Water is removed from the soil so slowly that the upper 20 to 40 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Somewhat poorly drained.—Water is removed from the soil so slowly that the upper 10 to 20 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Poorly drained.—Water is removed so slowly that either the soil is periodically saturated or the upper 10 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water is at or on the surface most of the time. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of another horizon.

E horizon. The mineral horizon below an O or A horizon and above a B horizon. The E horizon is characterized by a loss of some combination of silicate clay, iron, and aluminum and by a remaining

concentration of sand and silt particles of quartz or other resistant minerals.

B horizon.—The mineral horizon below an A, E, or O horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or angular or subangular blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A, E, and B horizons are generally called the solum. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

R layer.—Hard bedrock beneath the soil. The bedrock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Parent material. The unconsolidated organic and mineral material in which soil forms.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. Includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1965-77 at Burlington, Iowa]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	29.5	11.9	20.7	62	-19	0	1.68	.57	2.56	3	7.0
February	36.5	18.4	27.5	66	-9	0	1.05	.44	1.54	3	3.7
March	48.1	28.6	38.3	80	7	51	2.68	1.46	3.67	6	3.9
April	62.3	41.2	51.8	86	22	115	4.02	1.99	5.66	7	1.3
May	71.9	51.1	61.6	90	33	375	3.56	2.22	4.77	7	.0
June	81.2	60.0	70.6	94	43	618	3.97	2.27	5.35	7	.0
July	85.4	64.8	75.1	98	48	778	3.41	1.92	4.62	6	.0
August	82.1	62.1	72.1	95	48	685	4.00	1.47	6.03	6	.0
September	74.6	54.5	64.6	91	36	438	4.32	2.15	6.09	7	.0
October	64.3	43.4	53.8	87	24	174	2.96	1.24	4.34	5	.3
November	48.3	30.9	39.6	73	8	11	2.01	.76	3.01	4	3.2
December	35.4	20.0	27.8	67	-8	0	2.01	.71	3.04	4	5.3
Yearly:											
Average	60.0	40.6	50.3	---	---	---	---	---	---	---	---
Extreme	---	---	---	99	-19	---	---	---	---	---	---
Total	---	---	---	---	---	3,245	35.67	29.37	41.65	65	24.7

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1965-77 at Burlington, Iowa]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 11	April 21	May 3
2 years in 10 later than--	April 7	April 17	April 29
5 years in 10 later than--	March 30	April 10	April 21
First freezing temperature in fall:			
1 year in 10 earlier than--	October 21	October 15	October 2
2 years in 10 earlier than--	October 26	October 20	October 7
5 years in 10 earlier than--	November 4	October 28	October 16

TABLE 3.--GROWING SEASON

[Recorded in the period 1965-77 at Burlington, Iowa]

Probability	Daily minimum temperature		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	199	184	159
8 years in 10	206	190	165
5 years in 10	218	201	178
2 years in 10	230	213	190
1 year in 10	237	218	197

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
41	Sparta loamy fine sand, 0 to 2 percent slopes	585	0.2
41B	Sparta loamy fine sand, 2 to 7 percent slopes	285	0.1
51	Vesser silt loam, 0 to 2 percent slopes	745	0.3
54	Zook silty clay loam, 0 to 2 percent slopes	2,960	1.1
56B	Cantril loam, 2 to 5 percent slopes	720	0.3
58E	Douds loam, 14 to 18 percent slopes	445	0.2
65D2	Lindley loam, 9 to 14 percent slopes, moderately eroded	435	0.2
65E	Lindley loam, 14 to 18 percent slopes	11,230	4.3
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded	20,775	7.8
65F	Lindley loam, 18 to 25 percent slopes	12,040	4.6
65G	Lindley loam, 25 to 40 percent slopes	3,110	1.2
74	Rubio silt loam, 0 to 2 percent slopes	590	0.2
75	Givin silt loam, 1 to 3 percent slopes	11,790	4.5
76B	Ladoga silt loam, 2 to 5 percent slopes	5,565	2.1
76C	Ladoga silt loam, 5 to 9 percent slopes	660	0.3
76C2	Ladoga silt loam, 5 to 9 percent slopes, moderately eroded	2,230	0.9
80B	Clinton silt loam, 2 to 5 percent slopes	14,660	5.6
80C	Clinton silt loam, 5 to 9 percent slopes	12,115	4.6
80C2	Clinton silt loam, 5 to 9 percent slopes, moderately eroded	11,990	4.6
80D	Clinton silt loam, 9 to 14 percent slopes	2,885	1.1
80D2	Clinton silt loam, 9 to 14 percent slopes, moderately eroded	1,170	0.4
122	Sperry silt loam, 0 to 1 percent slopes	445	0.2
130	Belinda silt loam, 0 to 2 percent slopes	215	0.1
131B	Pershing silt loam, 2 to 5 percent slopes	1,210	0.5
131C2	Pershing silt loam, 5 to 9 percent slopes, moderately eroded	310	0.1
132B	Weller silt loam, 2 to 5 percent slopes	1,510	0.6
132C	Weller silt loam, 5 to 9 percent slopes	505	0.2
132C2	Weller silt loam, 5 to 9 percent slopes, moderately eroded	560	0.2
133	Colo silty clay loam, 0 to 2 percent slopes	1,720	0.7
133B	Colo silty clay loam, 2 to 5 percent slopes	2,285	0.9
135	Coland clay loam, 0 to 2 percent slopes	3,050	1.2
158	Dorchester silt loam, 0 to 2 percent slopes	280	0.1
163B	Fayette silt loam, 2 to 5 percent slopes	1,455	0.6
163C	Fayette silt loam, 5 to 9 percent slopes	1,555	0.6
163C2	Fayette silt loam, 5 to 9 percent slopes, moderately eroded	420	0.2
163D	Fayette silt loam, 9 to 14 percent slopes	210	0.1
172	Wabash silty clay, 0 to 2 percent slopes	3,850	1.5
173	Hoopeston sandy loam, 0 to 2 percent slopes	1,090	0.4
174	Bolan loam, 0 to 2 percent slopes	325	0.1
174B	Bolan loam, 2 to 5 percent slopes	415	0.2
175	Dickinson fine sandy loam, 0 to 2 percent slopes	405	0.2
175B	Dickinson fine sandy loam, 2 to 5 percent slopes	328	0.1
179D2	Gara loam, 9 to 14 percent slopes, moderately eroded	220	0.1
179E	Gara loam, 14 to 18 percent slopes	225	0.1
179E2	Gara loam, 14 to 18 percent slopes, moderately eroded	470	0.2
180	Keomah silt loam, 1 to 3 percent slopes	7,965	3.0
208	Klum fine sandy loam, 0 to 2 percent slopes	1,055	0.4
220	Nodaway silt loam, 0 to 2 percent slopes	3,460	1.3
222C	Clarinda silty clay loam, 5 to 9 percent slopes	1,295	0.5
223C2	Rinda silt loam, 5 to 9 percent slopes, moderately eroded	630	0.2
223D2	Rinda silt loam, 9 to 14 percent slopes, moderately eroded	315	0.1
263	Okaw silt loam, 0 to 2 percent slopes	220	0.1
263B	Okaw silt loam, 2 to 5 percent slopes	250	0.1
279	Taintor silty clay loam, 0 to 1 percent slopes	21,140	8.0
280	Mahaska silty clay loam, 1 to 3 percent slopes	28,625	10.6
281B	Otley silty clay loam, 2 to 5 percent slopes	3,465	1.3
281C2	Otley silty clay loam, 5 to 9 percent slopes, moderately eroded	1,600	0.6
291	Atterberry silt loam, 1 to 3 percent slopes	315	0.1
362	Haig silt loam, 0 to 2 percent slopes	785	0.3
364B	Grundy silty clay loam, 1 to 4 percent slopes	820	0.3
424D	Lindley-Keswick loams, 9 to 14 percent slopes	265	0.1
424D2	Lindley-Keswick loams, 9 to 14 percent slopes, moderately eroded	1,720	0.7
425D	Keswick loam, 9 to 14 percent slopes	435	0.2
425D2	Keswick loam, 9 to 14 percent slopes, moderately eroded	1,255	0.5
430	Ackmore silt loam, 0 to 2 percent slopes	1,160	0.4
453	Tuskeego silt loam, 1 to 3 percent slopes	290	0.1
478G	Nordness-Rock outcrop complex, 25 to 40 percent slopes	1,275	0.5
484	Lawson silt loam, 0 to 2 percent slopes	1,210	0.5
499F	Nordness silt loam, 14 to 25 percent slopes	670	0.3
520	Coppock silt loam, 0 to 2 percent slopes	460	0.2
570B	Nira silty clay loam, 2 to 5 percent slopes	4,385	1.7
570C2	Nira silty clay loam, 5 to 9 percent slopes, moderately eroded	1,485	0.6

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
571B	Hedrick silt loam, 2 to 5 percent slopes	2,345	0.9
571C2	Hedrick silt loam, 5 to 9 percent slopes, moderately eroded	3,280	1.3
572B	Inton silt loam, 2 to 5 percent slopes	600	0.2
572C2	Inton silt loam, 5 to 9 percent slopes, moderately eroded	1,300	0.5
730B	Nodaway-Cantril-Klum complex, 2 to 5 percent slopes	4,090	1.6
779	Kalona silty clay loam, 0 to 1 percent slopes	785	0.3
793	Bertrand silt loam, 0 to 2 percent slopes	530	0.2
793B	Bertrand silt loam, 2 to 5 percent slopes	510	0.2
795D2	Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded	290	0.1
834	Titus silty clay loam, 0 to 2 percent slopes	3,150	1.2
880B	Clinton silt loam, benches, 2 to 5 percent slopes	995	0.4
893D2	Gara-Rinda complex, 9 to 14 percent slopes, moderately eroded	1,325	0.5
950	Niota Variant silty clay loam, 0 to 3 percent slopes	195	0.1
950D	Niota Variant silty clay loam, 7 to 14 percent slopes	115	*
960	Shaffton loam, 0 to 2 percent slopes	2,310	0.9
961	Ambraw loam, 0 to 2 percent slopes	390	0.1
1273B	Olmitz Variant loam, 2 to 5 percent slopes	285	0.1
1273C	Olmitz Variant loam, 5 to 10 percent slopes	465	0.2
1316	Fluvaquents, frequently flooded, 0 to 3 percent slopes	2,990	1.1
1587	Dolbee silt loam, 0 to 2 percent slopes	4,120	1.6
1826	Snider loam, 0 to 2 percent slopes	975	0.4
2208	Klum fine sandy loam, calcareous, 0 to 2 percent slopes	245	0.1
2226	Elrin loam, 0 to 2 percent slopes	1,030	0.4
2484	Lawson silt loam, frequently flooded, 0 to 2 percent slopes	660	0.3
4000	Urban land	725	0.3
5010	Pits, sand and gravel	95	*
5030	Pits, limestone quarry	285	0.1
5040	Orthents, loamy	80	*
5080	Orthents, nearly level	230	0.1
	Water	772	0.3
	Total	261,760	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Oats	Grass-legume hay	Bromegrass-alfalfa	Kentucky bluegrass
	Bu	Bu	Bu	Ton	AUM*	AUM*
41--- Sparta	60	24	33	2.4	4.0	2.2
41B--- Sparta	50	23	27	2.0	3.4	1.8
51--- Vesser	95	38	52	3.8	5.6	3.7
54--- Zook	96	38	55	4.0	5.8	3.8
56B--- Cantril	90	36	52	3.6	6.1	3.3
58E--- Douds	---	---	---	2.2	3.8	1.5
65D2--- Lindley	65	24	36	2.6	4.2	2.4
65E--- Lindley	---	---	---	2.2	3.8	1.5
65E2--- Lindley	---	---	---	1.5	3.0	1.2
65F, 65G--- Lindley	---	---	---	1.2	2.6	1.0
74--- Rubio	99	38	54	4.0	6.6	3.8
75--- Givin	112	43	64	4.9	7.6	4.2
76B--- Ladoga	108	43	62	4.3	7.8	4.3
76C--- Ladoga	103	41	55	4.1	7.0	3.8
76C2--- Ladoga	100	40	55	4.0	6.8	3.7
80B--- Clinton	101	41	59	4.0	6.8	3.7
80C--- Clinton	96	39	52	3.8	6.5	3.5
80C2--- Clinton	93	38	51	3.8	6.3	3.4
80D--- Clinton	87	35	48	3.5	5.9	3.3
80D2--- Clinton	84	34	46	3.4	5.7	3.1
122--- Sperry	97	37	53	3.5	6.5	3.6

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Oats	Grass-legume hay	Bromegrass-alfalfa	Kentucky bluegrass
	Bu	Bu	Bu	Ton	AUM*	AUM*
130---------- Belinda	87	33	48	3.7	6.1	3.7
131B---------- Pershing	101	38	56	4.2	7.0	3.8
131C2---------- Pershing	91	33	50	3.8	6.3	3.4
132B---------- Weller	95	36	52	4.0	6.6	3.8
132C---------- Weller	90	34	50	3.8	6.3	3.7
132C2---------- Weller	85	32	46	3.2	5.5	3.5
133---------- Colo	104	40	78	4.2	7.0	4.2
133B---------- Colo	102	39	76	4.0	6.6	4.2
135---------- Coland	98	40	55	4.0	6.6	3.6
158---------- Dorchester	93	38	52	3.8	6.3	3.5
163B---------- Fayette	113	43	65	4.7	7.8	4.0
163C---------- Fayette	108	41	60	4.5	7.5	3.8
163C2---------- Fayette	105	40	58	4.4	7.5	3.6
163D---------- Fayette	99	38	55	4.2	7.0	3.6
172---------- Wabash	68	26	37	1.8	4.6	2.0
173---------- Hoopeston	95	30	54	3.7	6.8	3.0
174---------- Bolan	90	34	50	3.8	6.3	3.6
174B---------- Bolan	88	33	50	3.7	6.1	3.6
175---------- Dickinson	78	30	43	3.0	5.0	2.7
175B---------- Dickinson	76	30	42	3.0	5.0	2.7
179D2---------- Gara	75	28	41	3.1	5.1	2.5
179E---------- Gara	---	---	---	2.5	4.1	1.7
179E2---------- Gara	---	---	---	2.2	3.8	1.5

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Oats	Grass-legume hay	Bromegrass-alfalfa	Kentucky bluegrass
	Bu	Bu	Bu	Ton	AUM*	AUM*
180---------- Keomah	105	42	57	4.3	7.1	3.6
208---------- Klum	81	29	40	3.4	5.6	2.6
220---------- Nodaway	114	42	60	4.6	7.6	4.0
222C---------- Clarinda	60	24	34	2.6	4.3	2.0
223C2---------- Rinda	50	20	27	2.0	3.4	1.9
223D2---------- Rinda	40	16	22	1.7	2.8	1.7
263, 263B---------- Okaw	80	27	42	3.1	3.8	3.0
279---------- Taintor	117	44	64	4.7	7.8	4.2
280---------- Mahaska	125	48	69	5.2	8.6	4.5
281B---------- Otley	119	45	65	5.0	8.3	4.3
281C2---------- Otley	111	42	61	4.7	7.8	3.9
291---------- Atterberry	118	47	65	4.8	8.0	4.3
362---------- Haig	105	40	58	4.2	7.0	3.8
364B---------- Grundy	105	40	58	4.2	7.8	3.8
424D, 424D2---------- Lindley-Keswick	55	20	28	2.1	3.7	1.9
425D---------- Keswick	50	20	29	2.0	3.4	1.9
425D2---------- Keswick	44	17	24	1.8	3.0	1.3
430---------- Ackmore	106	40	58	4.5	7.5	3.8
453---------- Tuskeego	82	30	44	3.2	5.3	3.3
478G---------- Nordness-Rock outcrop	---	---	---	---	---	---
484---------- Lawson	122	46	67	5.1	8.2	4.2
499F---------- Nordness	---	---	---	0.5	0.8	0.7
520---------- Coppock	89	34	49	3.7	6.1	3.3

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Oats	Grass-legume hay	Bromegrass-alfalfa	Kentucky bluegrass
	Bu	Bu	Bu	Ton	AUM*	AUM*
570B---------- Nira	114	43	63	4.8	8.0	4.5
570C2---------- Nira	106	40	58	4.5	7.5	3.9
571B---------- Hedrick	109	41	60	4.6	7.6	4.0
571C2---------- Hedrick	101	38	55	4.2	7.0	3.6
572B---------- Inton	98	36	53	4.2	7.0	3.7
572C2---------- Inton	90	33	48	3.9	6.5	3.3
730B---------- Nodaway-Cantril-Klum	85	34	53	3.7	6.8	3.5
779---------- Kalona	115	44	64	4.7	7.8	4.2
793---------- Bertrand	100	38	55	4.2	5.0	2.9
793B---------- Bertrand	96	37	54	4.1	4.9	2.7
795D2---------- Ashgrove	40	16	22	1.8	3.0	1.5
834---------- Titus	85	30	41	3.0	4.6	3.0
880B---------- Clinton	98	38	56	4.2	5.9	4.0
893D2---------- Gara-Rinda	67	25	36	2.7	4.5	2.3
950---------- Niota Variant	62	24	34	2.5	4.1	2.5
950D---------- Niota Variant	38	14	21	2.0	3.3	2.1
960---------- Shaffton	110	40	55	4.0	6.6	4.1
961---------- Ambraw	96	38	52	3.8	6.4	3.6
1273B---------- Olmitz Variant	100	38	55	4.2	7.0	3.9
1273C---------- Olmitz Variant	95	36	52	4.0	6.6	3.7
1316**. Fluvaquents						
1587---------- Dolbee	109	42	60	4.5	7.5	4.0
1826---------- Snider	124	46	95	5.3	8.6	4.1

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Oats	Grass-legume hay	Bromegrass-alfalfa	Kentucky bluegrass
	Bu	Bu	Bu	Ton	AUM*	AUM*
2208---------- Klum	81	31	44	3.4	5.6	2.6
2226---------- Elrin	110	40	88	4.3	7.1	4.1
2484---------- Lawson	---	---	---	---	---	3.0
4000**. Urban land						
5010**, 5030**. Pits						
5040**, 5080**. Orthents						

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	42,235	---	---	---
II	99,225	36,550	58,525	4,150
III	54,665	45,460	9,205	---
IV	9,170	7,005	1,295	870
V	4,040	---	4,040	---
VI	33,145	33,145	---	---
VII	17,095	15,150	---	1,945
VIII	---	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
41, 41B---------- Sparta	3s	Slight	Slight	Severe	Slight	Northern red oak----	70	Eastern white pine, red pine, jack pine.
						Red pine----------	---	
						Eastern white pine--	---	
						Jack pine----------	---	
56B---------- Cantril	2o	Slight	Slight	Slight	Slight	White oak----------	75	Eastern white pine, red pine, European larch, sugar maple.
58E---------- Douds	4r	Moderate	Moderate	Slight	Slight	White oak----------	55	Eastern white pine, red pine, European larch, sugar maple.
						Northern red oak----	55	
65D2---------- Lindley	5o	Slight	Slight	Slight	Slight	Northern red oak----	50	White oak, green ash, yellow-poplar, black oak.
65E---------- Lindley	5r	Moderate	Moderate	Slight	Slight	White oak----------	50	White oak, green ash, black oak.
						Northern red oak----	50	
65E2---------- Lindley	5r	Moderate	Moderate	Moderate	Slight	White oak----------	50	White oak, green ash, yellow-poplar, black oak.
						Northern red oak----	50	
65F, 65G---------- Lindley	5r	Moderate	Moderate	Slight	Slight	White oak----------	50	White oak, green ash, yellow-poplar, black oak.
						Post oak----------	---	
						Blackjack oak-------	---	
						Black oak----------	---	
						White oak----------	---	
						Post oak----------	---	
74---------- Rubio	5w	Slight	Severe	Moderate	Moderate	White oak----------	45	Silver maple, American sycamore, green ash, northern white-cedar.
75---------- Givin	3o	Slight	Slight	Slight	Slight	White oak----------	65	Eastern white pine, white oak, red pine, northern red oak, sugar maple.
						Northern red oak----	70	
76B, 76C, 76C2----- Ladoga	2o	Slight	Slight	Slight	Slight	White oak----------	75	Eastern white pine, red pine, European larch, sugar maple.
						Northern red oak----	75	
80B, 80C, 80C2, 80D, 80D2--------- Clinton	3o	Slight	Slight	Slight	Slight	White oak----------	65	Eastern white pine, red pine, European larch, black walnut.
						Northern red oak----	65	
130---------- Belinda	5w	Slight	Severe	Moderate	Moderate	White oak----------	45	Eastern cottonwood, silver maple, American sycamore, green ash.
131B, 131C2-------- Pershing	4c	Slight	Slight	Severe	Severe	White oak----------	55	Eastern white pine, white oak, red pine.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
132B, 132C, 132C2-- Weller	4c	Slight	Slight	Severe	Severe	White oak	55	Eastern white pine, red pine, European larch, black walnut, sugar maple.
158 Dorchester	4o	Slight	Slight	Moderate	Slight	White oak Northern red oak	55 55	Austrian pine, hackberry, green ash.
163B, 163C, 163C2, 163D Fayette	2o	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Black walnut	80 80 90 ---	Eastern white pine, northern red oak, green ash, black walnut.
179D2 Gara	4o	Slight	Slight	Slight	Slight	White oak Northern red oak	55 55	Eastern white pine, red pine.
179E, 179E2 Gara	4r	Moderate	Moderate	Slight	Slight	White oak Northern red oak	55 55	Eastern white pine, red pine.
180 Keomah	3o	Slight	Slight	Slight	Slight	White oak Northern red oak	65 70	Eastern white pine, white oak, red pine, northern red oak, black walnut, sugar maple.
220 Nodaway	3o	Slight	Slight	Slight	Slight	White oak	65	Eastern white pine, red pine, European larch, black walnut, sugar maple.
223C2, 223D2 Rinda	5w	Slight	Severe	Moderate	Moderate	White oak Northern red oak	45 45	Silver maple, American sycamore, green ash, hackberry.
263, 263B Okaw	4w	Slight	Severe	Severe	Severe	Pin oak Blackjack oak Black oak	70 60 55	Pin oak, green ash, red maple, swamp white oak.
291 Atterberry	3o	Slight	Slight	Slight	Slight	White oak Northern red oak Green ash Bur oak	65 --- --- ---	Eastern white pine, red pine, eastern redcedar, white oak, green ash.
424D*, 424D2*: Lindley	4o	Slight	Slight	Slight	Slight	White oak Northern red oak	60 50	White oak, green ash, yellow-poplar, black oak.
Keswick	4c	Slight	Slight	Slight	Moderate	White oak Northern red oak	55 55	Eastern white pine, red pine, European larch, sugar maple.
425D, 425D2 Keswick	4c	Slight	Slight	Slight	Moderate	White oak Northern red oak	55 55	Eastern white pine, red pine, European larch, sugar maple.
430 Ackmore	2o	Slight	Slight	Slight	Slight	White oak	65	Eastern white pine, red pine, European larch, sugar maple, poplar.
453 Tuskeego	3w	Slight	Severe	Moderate	Moderate	Eastern cottonwood Silver maple	90 80	Eastern cottonwood, silver maple, American sycamore, green ash.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
478G*:								
Nordness	5d	Moderate	Moderate	Severe	Slight	Northern red oak White oak	45 45	
Rock outcrop.								
484 Lawson	2o	Slight	Slight	Slight	Slight	Sugar maple White ash	70 ---	Silver maple, white ash.
499F Nordness	5d	Moderate	Moderate	Severe	Slight	Northern red oak White oak	45 45	
520 Coppock	3o	Slight	Slight	Slight	Slight	White oak Northern red oak	65 65	Eastern white pine, red pine, European larch, sugar maple.
571B, 571C2 Hedrick	2o	Slight	Slight	Slight	Slight	White oak	75	Eastern white pine, red pine, sugar maple, white spruce.
572B, 572C2 Inton	3o	Slight	Slight	Slight	Slight	White oak Northern red oak	65 65	Eastern white pine, red pine, European larch, black walnut.
730B*:								
Nodaway	3o	Slight	Slight	Slight	Slight	White oak	65	Eastern white pine, red pine, European larch, black walnut, sugar maple.
Cantril	2o	Slight	Slight	Slight	Slight	White oak	75	Eastern white pine, red pine, European larch, sugar maple.
Klum.								
793, 793B Bertrand	2o	Slight	Slight	Slight	Slight	Northern red oak White ash White oak Bur oak	70 --- --- ---	Red pine, eastern white pine, black walnut.
795D2 Ashgrove	5w	Slight	Severe	Moderate	Moderate	White oak Northern red oak	45 45	Silver maple, American sycamore, green ash, hackberry.
880B Clinton	3o	Slight	Slight	Slight	Slight	White oak Northern red oak	65 65	Eastern white pine, red pine, European larch, black walnut.
893D2*:								
Gara	4o	Slight	Slight	Slight	Slight	White oak Northern red oak	55 55	Eastern white pine, red pine.
Rinda	5w	Slight	Severe	Moderate	Moderate	White oak Northern red oak	45 45	Silver maple, American sycamore, green ash, hackberry.
950, 950D Niota Variant	3w	Slight	Severe	Moderate	Moderate	White oak Pin oak Green ash Yellow-poplar	65 80 --- 80	Pin oak, red maple, green ash.
2484 Lawson	2o	Slight	Slight	Slight	Slight	Silver maple White ash	70 ---	Silver maple, white ash.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
41, 41B---------- Sparta	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Austrian pine, jack pine, red pine.	Eastern white pine	---
51---------- Vesser	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
54---------- Zook	---	Silky dogwood, Amur honeysuckle, American cranberrybush, Amur privet.	Norway spruce, northern white-cedar, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
56B---------- Cantril	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
58E---------- Douds	---	Silky dogwood, Amur privet, American cranberrybush, Amur honeysuckle.	Blue spruce, white fir, northern white-cedar, Washington hawthorn.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
65D2, 65E, 65E2, 65F, 65G--------- Lindley	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
74---------- Rubio	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Austrian pine, northern white-cedar, Washington hawthorn, Norway spruce, blue spruce, white fir.	Eastern white pine	Pin oak.
75---------- Givin	---	American cranberrybush, Amur honeysuckle, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Pin oak, eastern white pine.
76B, 76C, 76C2---- Ladoga	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
80B, 80C, 80C2, 80D, 80D2-------- Clinton	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
122---------- Sperry	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
130---------- Belinda	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Austrian pine, Norway spruce, blue spruce, northern white-cedar, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
131B, 131C2-------- Pershing	---	Eastern redcedar, Tatarian honeysuckle, Washington hawthorn, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Austrian pine, osageorange, green ash.	Eastern white pine, pin oak.	---
132B, 132C, 132C2-- Weller	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Washington hawthorn, Amur privet, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
133, 133B--------- Colo	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, blue spruce, white fir, northern white-cedar, Washington hawthorn.	Eastern white pine	Pin oak.
135---------- Coland	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
158---------- Dorchester	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, osageorange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow, golden willow.	Eastern cottonwood.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
163B, 163C, 163C2, 163D---------- Fayette	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
172---------- Wabash	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
173---------- Hoopeston	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
174, 174B---------- Bolan	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
175, 175B---------- Dickinson	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
179D2, 179E, 179E2---------- Gara	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Northern white-cedar, white fir, Washington hawthorn, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
180---------- Keomah	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
208---------- Klum	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Norway spruce-----	Pin oak, eastern white pine.
220---------- Nodaway	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
222C---------- Clarinda	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Green ash, osageorange.	Eastern white pine, pin oak, Austrian pine.	---
223C2, 223D2------ Rinda	---	Eastern redcedar, Washington hawthorn, arrowwood, Amur privet, American cranberrybush, Tatarian honeysuckle, Amur honeysuckle.	Green ash, Austrian pine, osageorange.	Eastern white pine, pin oak.	---
263, 263B--------- Okaw	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
279---------- Taintor	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Austrian pine, Washington hawthorn, northern white-cedar, Norway spruce, blue spruce, white fir.	Eastern white pine	Pin oak.
280---------- Mahaska	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, white fir, blue spruce, eastern white pine, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
281B, 281C2------- Otley	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
291---------- Atterberry	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
362---------- Haig	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, blue spruce, white fir, northern white-cedar, Washington hawthorn.	Eastern white pine	Pin oak.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
364B---------- Grundy	---	Washington hawthorn, Tatarian honeysuckle, Amur honeysuckle, Amur privet, American cranberrybush, arrowwood, eastern redcedar.	Austrian pine, osageorange, green ash.	Pin oak, eastern white pine.	---
424D*, 424D2*: Lindley----------	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Keswick----------	---	Eastern redcedar, Tatarian honeysuckle, Washington hawthorn, arrowwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
425D, 425D2------- Keswick	---	Eastern redcedar, Tatarian honeysuckle, Washington hawthorn, arrowwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
430---------- Ackmore	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
453---------- Tuskeego	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
478G*: Nordness.					
Rock outcrop.					
484---------- Lawson	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
499F. Nordness					
520---------- Coppock	---	Amur privet, silky dogwood, Amur honeysuckle.	Austrian pine, northern white-cedar, white fir, Washington hawthorn, blue spruce.	Norway spruce-----	Eastern white pine, pin oak.
570B, 570C2------- Nira	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	White fir, blue spruce, Washington hawthorn, northern white-cedar.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
571B, 571C2------- Hedrick	---	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
572B, 572C2------- Inton	---	American cranberrybush, Amur honeysuckle, Amur privet, silky dogwood.	Washington hawthorn, northern white-cedar, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak, silver maple.
730B*: Nodaway----------	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Cantril----------	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Klum----------	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Norway spruce-----	Pin oak, eastern white pine.
779---------- Kalona	---	Amur privet, Tatarian honeysuckle, silky dogwood, American cranberrybush.	Norway spruce, northern white-cedar, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
793, 793B--------- Bertrand	---	Tatarian honeysuckle, lilac.	Northern white-cedar, Siberian crabapple, white spruce, Amur maple.	Green ash, bur oak, eastern white pine, ponderosa pine, hackberry.	Silver maple.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
795D2---------- Ashgrove	---	Eastern redcedar, Tatarian honeysuckle, Washington hawthorn, arrowwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
834---------- Titus	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
880B---------- Clinton	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
893D2*:					
Gara----------	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Northern white-cedar, white fir, Washington hawthorn, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
Rinda----------	---	Eastern redcedar, Washington hawthorn, arrowwood, Amur privet, American cranberrybush, Tatarian honeysuckle, Amur honeysuckle.	Green ash, Austrian pine, osageorange.	Eastern white pine, pin oak.	---
950, 950D---------- Niota Variant	---	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	Washington hawthorn, northern white-cedar, white fir, blue spruce, Norway spruce, Austrian pine.	Eastern white pine	Pin oak.
960---------- Shaffton	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
961---------- Ambraw	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
1273B, 1273C------ Olmitz Variant	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, osageorange, eastern redcedar, northern white-cedar, white spruce, nanny-berry viburnum, Washington hawthorn.	Black willow, golden willow.	Eastern cottonwood.
1316*. Fluvaquents					
1587---------- Dolbee	---	Silky dogwood, Amur honeysuckle, American cranberrybush, Amur privet.	Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn, northern white-cedar.	Eastern white pine	Pin oak.
1826---------- Snider	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
2208---------- Klum	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Norway spruce-----	Pin oak, eastern white pine.
2226---------- Elrin	---	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	White fir, northern white-cedar, blue spruce, Washington hawthorn, Austrian pine.	Norway spruce-----	Eastern white pine, pin oak.
2484---------- Lawson	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
4000*. Urban land					
5010*, 5030*. Pits					
5040*, 5080*. Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
41 Sparta	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
41B Sparta	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
51 Vesser	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
54 Zook	Severe: wetness, flooding.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
56B Cantril	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
58E Douds	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
65D2 Lindley	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
65E, 65E2, 65F, 65G Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
74 Rubio	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
75 Givin	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
76B Ladoga	Slight	Slight	Moderate: slope.	Slight	Slight.
76C, 76C2 Ladoga	Slight	Slight	Severe: slope.	Slight	Slight.
80B Clinton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
80C, 80C2 Clinton	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Slight.
80D, 80D2 Clinton	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
122 Sperry	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
130 Belinda	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
131B Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
131C2---------- Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Slight----------	Slight.
132B---------- Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight----------	Slight.
132C, 132C2---------- Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Slight----------	Slight.
133, 133B---------- Colo	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
135---------- Coland	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
158---------- Dorchester	Severe: flooding.	Slight----------	Slight----------	Slight----------	Slight.
163B---------- Fayette	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
163C, 163C2---------- Fayette	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
163D---------- Fayette	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
172---------- Wabash	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
173---------- Hoopeston	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
174---------- Bolan	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
174B---------- Bolan	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
175---------- Dickinson	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
175B---------- Dickinson	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
179D2---------- Gara	Moderate: percs slowly, slope.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
179E, 179E2---------- Gara	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
180---------- Keomah	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight----------	Slight
208---------- Klum	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
220---------- Nodaway	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
222C---------- Clarinda	Severe: percs slowly, wetness.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Slight----------	Moderate: wetness.
223C2---------- Rinda	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Slight----------	Moderate: wetness.
223D2---------- Rinda	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
263, 263B---------- Okaw	Severe: flooding, wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
279---------- Taintor	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
280---------- Mahaska	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight----------	Slight.
281B---------- Otley	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
281C2---------- Otley	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
291---------- Atterberry	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
362---------- Haig	Severe: wetness, percs slowly, excess humus.	Severe: excess humus, percs slowly.	Severe: excess humus, wetness, percs slowly.	Severe: excess humus.	Moderate: wetness.
364B---------- Grundy	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
424D*, 424D2*: Lindley----------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
Keswick----------	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness, slope.
425D, 425D2---------- Keswick	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
430---------- Ackmore	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
453---------- Tuskeego	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
478G*: Nordness	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.					
484 Lawson	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
499F Nordness	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, thin layer.
520 Coppock	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
570B Nira	Slight	Slight	Moderate: slope.	Slight	Slight.
570C2 Nira	Slight	Slight	Severe: slope.	Slight	Slight.
571B Hedrick	Slight	Slight	Moderate: slope.	Slight	Slight.
571C2 Hedrick	Slight	Slight	Severe: slope.	Slight	Slight.
572B Inton	Slight	Slight	Moderate: slope.	Slight	Slight.
572C2 Inton	Slight	Slight	Severe: slope.	Slight	Slight.
730B*: Nodaway	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Cantril	Severe: flooding.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
Klum	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
779 Kalona	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
793 Bertrand	Slight	Slight	Slight	Slight	Slight.
793B Bertrand	Slight	Slight	Moderate: slope.	Slight	Slight.
795D2 Ashgrove	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
834 Titus	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
880B---------- Clinton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
893D2*: Gara----------	Moderate: percs slowly, slope.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
Rinda----------	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
950---------- Niota Variant	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
950D---------- Niota Variant	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: slope, wetness, percs slowly.	Severe: wetness.	Severe: wetness.
960---------- Shaffton	Severe: flooding.	Slight----------	Slight----------	Slight----------	Slight.
961---------- Ambraw	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
1273B---------- Olmitz Variant	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
1273C---------- Olmitz Variant	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
1316*. Fluvaquents					
1587---------- Dolbee	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
1826---------- Snider	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
2208---------- Klum	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
2226---------- Elrin	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
2484---------- Lawson	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
4000*. Urban land					
5010*, 5030*. Pits					
5040*, 5080*. Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
41, 41B---------- Sparta	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
51---------- Vesser	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
54---------- Zook	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
56B---------- Cantril	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
58E---------- Douds	Very poor.	Good	Fair	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
65D2---------- Lindley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
65E, 65E2, 65F, 65G---------- Lindley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
74---------- Rubio	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
75---------- Givin	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
76B---------- Ladoga	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
76C, 76C2---------- Ladoga	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
80B---------- Clinton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
80C, 80C2, 80D, 80D2---------- Clinton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
122---------- Sperry	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
130---------- Belinda	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
131B---------- Pershing	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
131C2---------- Pershing	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
132B---------- Weller	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
132C, 132C2-------- Weller	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
133---------- Colo	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
133B---------- Colo	Good	Fair	Good	Fair	Poor	Fair	Very poor.	Fair	Fair	Poor.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
135---------- Coland	Good	Good	Good	Fair	Fair	Good	Good	Good	Fair	Good.
158---------- Dorchester	Fair	Fair	Fair	Fair	Poor	Poor	Poor	Fair	Poor	Poor.
163B---------- Fayette	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
163C, 163C2, 163D-- Fayette	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
172---------- Wabash	Poor	Poor	Poor	Poor	Poor	Poor	Good	Poor	Poor	Fair.
173---------- Hoopeston	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
174, 174B---------- Bolan	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
175, 175B---------- Dickinson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
179D2---------- Gara	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Poor.
179E, 179E2-------- Gara	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
180---------- Keomah	Good	Good	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair.
208---------- Klum	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
220---------- Nodaway	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
222C---------- Clarinda	Poor	Fair	Poor	Fair	Poor	Poor	Poor	Fair	Fair	Poor.
223C2, 223D2------- Rinda	Poor	Fair	Poor	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.
263---------- Okaw	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
263B---------- Okaw	Poor	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Fair	Very poor.
279---------- Taintor	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
280---------- Mahaska	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
281B---------- Otley	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
281C2---------- Otley	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
291---------- Atterberry	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
362---------- Haig	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
364B---------- Grundy	Fair	Good	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
424D*, 424D2*: Lindley----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Keswick----------	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
425D, 425D2-------- Keswick	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
430---------- Ackmore	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
453---------- Tuskeego	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
478G*: Nordness----------	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
484---------- Lawson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
499F---------- Nordness	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
520---------- Coppock	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
570B---------- Nira	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
570C2---------- Nira	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
571B---------- Hedrick	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
571C2---------- Hedrick	Fair	Good	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
572B---------- Inton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
572C2---------- Inton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
730B*: Nodaway----------	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
Cantril----------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Klum----------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
779---------- Kalona	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
793, 793B---------- Bertrand	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
795D2---------- Ashgrove	Poor	Fair	Poor	Fair	Poor	Poor	Poor	Fair	Fair	Poor.
834---------- Titus	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
880B---------- Clinton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
893D2*:										
Gara----------	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Poor.
Rinda----------	Poor	Fair	Poor	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.
950, 950D---------- Niota Variant	Fair	Good	Good	Good	Good	Good	Good	Good	Good	Fair.
960---------- Shaffton	Good	Good	Good	Good	Fair	Good	Good	Good	Good	Good.
961---------- Ambraw	Good	Fair	Good	Good	Fair	Good	Good	Good	Good	Good.
1273B---------- Olmitz Variant	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
1273C---------- Olmitz Variant	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
1316*. Fluvaquents										
1587---------- Dolbee	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
1826---------- Snider	Good	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
2208---------- Klum	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
2226---------- Elrin	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
2484---------- Lawson	Poor	Fair	Fair	Poor	Poor	Good	Fair	Poor	Poor	Fair.
4000*. Urban land										
5010*, 5030*. Pits										
5040*, 5080*. Orthents										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
41---------- Sparta	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
41B---------- Sparta	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
51---------- Vesser	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, frost action.	Moderate: wetness.
54---------- Zook	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, frost action.	Moderate: wetness.
56B---------- Cantril	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
58E---------- Douds	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
65D2---------- Lindley	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
65E, 65E2, 65F, 65G---------- Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
74---------- Rubio	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness.	Severe: shrink-swell, wetness, low strength.	Severe: wetness.
75---------- Givin	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action, low strength.	Slight.
76B---------- Ladoga	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
76C, 76C2--------- Ladoga	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
80B---------- Clinton	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
80C, 80C2--------- Clinton	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
80D, 80D2--------- Clinton	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
122---------- Sperry	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
130--Belinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
131B, 131C2--Pershing	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
132B, 132C, 132C2--Weller	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, frost action, low strength.	Slight.
133, 133B--Colo	Severe: wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, low strength, frost action.	Moderate: wetness, flooding.
135--Coland	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, frost action.	Moderate: wetness.
158--Dorchester	Slight	Severe: flooding.	Severe: flooding, low strength.	Severe: flooding.	Severe: frost action.	Slight.
163B--Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
163C, 163C2--Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
163D--Fayette	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
172--Wabash	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness.	Severe: wetness, too clayey.
173--Hoopeston	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
174, 174B--Bolan	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
175, 175B--Dickinson	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
179D2--Gara	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
179E, 179E2--Gara	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
180--Keomah	Severe: wetness.	Severe: shrink-swell.	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, frost action, low strength.	Slight.
208--Klum	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
220---------- Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action, low strength.	Moderate: flooding.
222C---------- Clarinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: frost action, low strength, shrink-swell.	Moderate: wetness.
223C2---------- Rinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: frost action, low strength, shrink-swell.	Moderate: wetness.
223D2---------- Rinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: frost action, low strength, shrink-swell.	Moderate: wetness, slope.
263, 263B--------- Okaw	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
279---------- Taintor	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
280---------- Mahaska	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: low strength, frost action.	Slight.
281B---------- Otley	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
281C2---------- Otley	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.	Slight.
291---------- Atterberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
362---------- Haig	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
364B---------- Grundy	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
424D*, 424D2*:						
Lindley----------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Keswick----------	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness, slope.
425D, 425D2------- Keswick	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness, slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
430--Ackmore	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: low strength, frost action.	Moderate: wetness.
453--Tuskeego	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
478G*: Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
484--Lawson	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
499F--Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, thin layer.
520--Coppock	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, low strength, frost action.	Moderate: wetness, flooding.
570B--Nira	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
570C2--Nira	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
571B--Hedrick	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
571C2--Hedrick	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength, frost action.	Slight.
572B--Inton	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
572C2--Inton	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
730B*: Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action, low strength.	Moderate: flooding.
Cantril	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Slight.
Klum	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
779---------- Kalona	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
793, 793B---------- Bertrand	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
795D2---------- Ashgrove	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness, slope.
834---------- Titus	Severe: cutbanks cave, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness.	Severe: wetness.
880B---------- Clinton	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
893D2*: Gara----------	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Rinda----------	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: frost action, low strength, shrink-swell.	Moderate: wetness, slope.
950---------- Niota Variant	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, frost action.	Severe: wetness.
950D---------- Niota Variant	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: low strength, wetness, frost action.	Severe: wetness.
960---------- Shaffton	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
961---------- Ambraw	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
1273B---------- Olmitz Variant	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
1273C---------- Olmitz Variant	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
1316*. Fluvaquents						
1587---------- Dolbee	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, frost action.	Moderate: wetness.
1826---------- Snider	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
2208---------- Klum	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
2226---------- Elrin	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Severe: frost action.	Slight.
2484---------- Lawson	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
4000*. Urban land						
5010*, 5030*. Pits						
5040*, 5080*. Orthents						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
41, 41B---------- Sparta	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
51---------- Vesser	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
54---------- Zook	Severe: percs slowly, wetness.	Slight----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, wetness, hard to pack.
56B---------- Cantril	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
58E---------- Douds	Severe: slope.	Severe: seepage, slope.	Severe: seepage, wetness, slope.	Severe: seepage, slope.	Poor: slope.
65D2---------- Lindley	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
65E, 65E2, 65F, 65G- Lindley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
74---------- Rubio	Severe: percs slowly, wetness.	Slight----------	Severe: wetness.	Severe: wetness.	Poor: wetness, too clayey.
75---------- Givin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
76B---------- Ladoga	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
76C, 76C2---------- Ladoga	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
80B---------- Clinton	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
80C, 80C2---------- Clinton	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
80D, 80D2---------- Clinton	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: too clayey, slope.
122---------- Sperry	Severe: ponding, percs slowly.	Slight----------	Severe: ponding.	Severe: ponding.	Poor: ponding.
130---------- Belinda	Severe: wetness, percs slowly.	Slight----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
131B--Pershing	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey.
131C2--Pershing	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey.
132B--Weller	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
132C, 132C2--Weller	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
133, 133B--Colo	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Poor: wetness, hard to pack.
135--Coland	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness.	Poor: wetness, hard to pack.
158--Dorchester	Moderate: flooding.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
163B--Fayette	Slight	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
163C, 163C2--Fayette	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
163D--Fayette	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
172--Wabash	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack,
173--Hoopeston	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
174, 174B--Bolan	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
175, 175B--Dickinson	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
179D2--Gara	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: too clayey, slope.
179E, 179E2--Gara	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
180--Keomah	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
208 Klum	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
220 Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
222C Clarinda	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, wetness, hard to pack.
223C2, 223D2 Rinda	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, wetness, hard to pack.
263 Okaw	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
263B Okaw	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
279 Taintor	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
280 Mahaska	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
281B Otley	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
281C2 Otley	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
291 Atterberry	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
362 Haig	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
364B Grundy	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
424D*, 424D2*:					
Lindley	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Keswick	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
425D, 425D2--------- Keswick	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
430----------------- Ackmore	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness, hard to pack.
453----------------- Tuskeego	Severe: wetness, percs slowly.	Severe: flooding.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
478G*: Nordness-----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: area reclaim, slope.
Rock outcrop.					
484----------------- Lawson	Severe: flooding, wetness.	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
499F---------------- Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: area reclaim, slope.
520----------------- Coppock	Severe: wetness, flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
570B---------------- Nira	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Poor: hard to pack.
570C2--------------- Nira	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----------	Poor: hard to pack.
571B---------------- Hedrick	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
571C2--------------- Hedrick	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
572B---------------- Inton	Slight-----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
572C2--------------- Inton	Slight-----------	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
730B*: Nodaway----------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Cantril----------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Klum----------	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
779---------- Kalona	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey, hard to pack.
793, 793B---------- Bertrand	Slight----------	Severe: seepage.	Severe: seepage.	Slight----------	Fair: too clayey, thin layer.
795D2---------- Ashgrove	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
834---------- Titus	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
880B---------- Clinton	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
893D2*:					
Gara----------	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: too clayey, slope.
Rinda----------	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, wetness, hard to pack.
950---------- Niota Variant	Severe: wetness, percs slowly.	Slight----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
950D---------- Niota Variant	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
960---------- Shaffton	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Good.
961---------- Ambraw	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
1273B---------- Olmitz Variant	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
1273C---------- Olmitz Variant	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
1316*. Fluvaquents					
1587---------- Dolbee	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1826---------- Snider	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
2208---------- Klum	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
2226---------- Elrin	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness, seepage.	Severe: seepage, wetness.	Poor: seepage.
2484---------- Lawson	Severe: flooding, wetness.	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
4000*. Urban land					
5010*, 5030*. Pits					
5040*, 5080*. Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
41, 41B---------- Sparta	Good----------	Probable----------	Improbable: too sandy.	Fair: too sandy.
51---------- Vesser	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
54---------- Zook	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
56B---------- Cantril	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
58E---------- Douds	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
65D2---------- Lindley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
65E, 65E2, 65F, 65G--- Lindley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
74---------- Rubio	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
75---------- Givin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
76B, 76C, 76C2-------- Ladoga	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
80B, 80C, 80C2, 80D, 80D2---------- Clinton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
122---------- Sperry	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
130---------- Belinda	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
131B, 131C2---------- Pershing	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
132B, 132C, 132C2----- Weller	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
133, 133B---------- Colo	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
135---------- Coland	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
158--Dorchester	Fair: low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Good.
163B, 163C, 163C2--Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
163D--Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, thin layer.
172--Wabash	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
173--Hoopeston	Fair: wetness.	Probable	Improbable: too sandy.	Fair: small stones, thin layer.
174, 174B--Bolan	Good	Probable	Improbable: too sandy.	Good.
175, 175B--Dickinson	Good	Probable	Improbable: too sandy.	Good.
179D2--Gara	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
179E, 179E2--Gara	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
180--Keomah	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
208--Klum	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
220--Nodaway	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
222C--Clarinda	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
223C2, 223D2--Rinda	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
263, 263B--Okaw	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
279--Taintor	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
280--Mahaska	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
281B, 281C2--Otley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
291--Atterberry	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
362 Haig	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
364B Grundy	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
424D*, 424D2*: Lindley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Keswick	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
425D, 425D2 Keswick	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
430 Ackmore	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
453 Tuskeego	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
478G*: Nordness	Poor: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Rock outcrop.				
484 Lawson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
499F Nordness	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
520 Coppock	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
570B, 570C2 Nira	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
571B, 571C2 Hedrick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
572B, 572C2 Inton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
730B*: Nodaway	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Cantril	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Klum	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
779 Kalona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
793, 793B---------- Bertrand	Good----------	Probable----------	Improbable: too sandy.	Good.
795D2---------- Ashgrove	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
834---------- Titus	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
880B---------- Clinton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
893D2*: Gara----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
Rinda----------	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
950, 950D---------- Niota Variant	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
960---------- Shaffton	Good----------	Probable----------	Improbable: too sandy.	Good.
961---------- Ambraw	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1273B, 1273C---------- Olmitz Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
1316*. Fluvaquents				
1587---------- Dolbee	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
1826---------- Snider	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
2208---------- Klum	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
2226---------- Elrin	Good----------	Probable----------	Improbable: too sandy.	Good.
2484---------- Lawson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
4000*. Urban land				
5010*, 5030*. Pits				
5040*, 5080*. Orthents				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
41, 41B---------- Sparta	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
51---------- Vesser	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness--------	Wetness, erodes easily.	Erodes easily, wetness.
54---------- Zook	Slight---------	Severe: hard to pack, wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Not needed-----	Not needed.
56B---------- Cantril	Moderate: seepage, slope.	Moderate: wetness.	Frost action, slope.	Wetness, rooting depth, slope.	Wetness--------	Rooting depth.
58E---------- Douds	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Slope, too sandy.	Slope.
65D2, 65E, 65E2, 65F, 65G--------- Lindley	Severe: slope.	Slight---------	Deep to water	Slope----------	Slope----------	Slope.
74---------- Rubio	Slight---------	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Wetness, erodes easily, percs slowly.	Wetness, erodes easily, percs slowly.
75---------- Givin	Slight---------	Moderate: wetness, hard to pack.	Frost action---	Wetness--------	Wetness, erodes easily.	Erodes easily.
76B, 76C, 76C2---- Ladoga	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Slope----------	Erodes easily	Erodes easily.
80B, 80C, 80C2---- Clinton	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
80D, 80D2--------- Clinton	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
122---------- Sperry	Slight---------	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding.	Wetness, erodes easily, percs slowly.
130---------- Belinda	Slight---------	Severe: wetness.	Percs slowly---	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
131B, 131C2------- Pershing	Moderate: slope.	Moderate: hard to pack, wetness.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Wetness, erodes easily.	Erodes easily, percs slowly.
132B, 132C, 132C2- Weller	Moderate: slope.	Moderate: hard to pack, wetness.	Slope, percs slowly, frost action.	Wetness, percs slowly, slope.	Wetness, erodes easily.	Percs slowly, erodes easily.
133---------- Colo	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Flooding, wetness.	Wetness--------	Wetness.
133B---------- Colo	Moderate: seepage, slope.	Severe: wetness.	Flooding, frost action, slope.	Wetness, slope, flooding.	Wetness--------	Wetness.
135---------- Coland	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness--------	Wetness--------	Wetness.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
158---------- Dorchester	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
163B, 163C, 163C2- Fayette	Moderate: slope, seepage.	Slight---------	Deep to water	Slope, erodes easily.	Favorable------	Erodes easily.
163D---------- Fayette	Severe: slope.	Slight---------	Deep to water	Slope, erodes easily.	Slope----------	Slope, erodes easily.
172---------- Wabash	Slight---------	Severe: hard to pack, wetness.	Percs slowly---	Wetness, droughty, slow intake.	Wetness, percs slowly.	Wetness, droughty, percs slowly.
173---------- Hoopeston	Severe: seepage.	Severe: seepage, piping, wetness.	Frost action, cutbanks cave.	Wetness, soil blowing.	Wetness, too sandy, soil blowing.	Wetness.
174---------- Bolan	Severe: seepage.	Severe: seepage, piping.	Deep to water	Favorable------	Too sandy------	Favorable.
174B---------- Bolan	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope----------	Too sandy------	Favorable.
175---------- Dickinson	Severe: seepage.	Severe: seepage.	Deep to water	Soil blowing---	Soil blowing, too sandy.	Favorable.
175B---------- Dickinson	Severe: seepage.	Severe: seepage.	Deep to water	Soil blowing, slope.	Soil blowing, too sandy.	Favorable.
179D2, 179E, 179E2---------- Gara	Severe: slope.	Slight---------	Deep to water	Slope----------	Slope----------	Slope.
180---------- Keomah	Slight---------	Moderate: wetness.	Frost action---	Wetness, erodes easily.	Wetness, erodes easily.	Erodes easily.
208---------- Klum	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing, flooding.	Soil blowing---	Favorable.
220---------- Nodaway	Moderate: seepage.	Severe: piping.	Deep to water	Flooding, erodes easily.	Erodes easily	Erodes easily.
222C---------- Clarinda	Moderate: slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness.	Wetness, erodes easily.
223C2---------- Rinda	Moderate: slope.	Severe: hard to pack.	Slope, percs slowly, frost action.	Wetness, percs slowly, slope.	Erodes easily, wetness.	Erodes easily, wetness.
223D2---------- Rinda	Severe: slope.	Severe: hard to pack.	Slope, percs slowly, frost action.	Wetness, percs slowly, slope.	Slope, wetness, erodes easily.	Wetness, slope, erodes easily.
263---------- Okaw	Slight---------	Severe: hard to pack, wetness.	Percs slowly---	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
263B---------- Okaw	Moderate: slope.	Severe: hard to pack, wetness.	Percs slowly---	Wetness, percs slowly, slope.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
279---------- Taintor	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
280---------- Mahaska	Moderate: seepage.	Moderate: wetness, hard to pack.	Frost action---	Wetness--------	Wetness, erodes easily.	Erodes easily.
281B, 281C2------- Otley	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Slope----------	Erodes easily	Erodes easily.
291---------- Atterberry	Moderate: seepage.	Severe: wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Wetness, erodes easily.
362---------- Haig	Slight---------	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
364B---------- Grundy	Slight---------	Severe: hard to pack.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
424D*, 424D2*: Lindley----------	Severe: slope.	Slight---------	Deep to water	Slope----------	Slope----------	Slope.
Keswick----------	Severe: slope.	Moderate: wetness.	Percs slowly, frost action, slope.	Wetness, percs slowly, rooting depth.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
425D, 425D2------- Keswick	Severe: slope.	Moderate: wetness.	Percs slowly, frost action, slope.	Wetness, percs slowly, rooting depth.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
430---------- Ackmore	Moderate: seepage.	Severe: hard to pack, wetness.	Frost action---	Wetness, erodes easily.	Wetness, erodes easily.	Wetness, erodes easily.
453---------- Tuskeego	Slight---------	Severe: thin layer, wetness.	Percs slowly---	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
478G*: Nordness----------	Severe: slope, depth to rock.	Severe: thin layer.	Deep to water	Droughty, slope, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Rock outcrop.						
484---------- Lawson	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
499F---------- Nordness	Severe: slope, depth to rock.	Severe: thin layer.	Deep to water	Droughty, slope, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
520---------- Coppock	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Flooding, wetness.	Wetness, erodes easily.	Wetness, erodes easily.
570B, 570C2------- Nira	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Slope----------	Erodes easily	Erodes easily.
571B, 571C2------- Hedrick	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Slope----------	Erodes easily	Erodes easily.
572B, 572C2------- Inton	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
730B*: Nodaway	Moderate: seepage.	Severe: piping.	Deep to water	Flooding, erodes easily.	Erodes easily	Erodes easily.
Cantril	Moderate: seepage, slope.	Moderate: wetness.	Frost action, slope.	Wetness, rooting depth, slope.	Wetness	Rooting depth.
Klum	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing, flooding.	Soil blowing	Favorable.
779 Kalona	Slight	Severe: wetness.	Frost action	Wetness	Wetness, erodes easily.	Wetness, erodes easily.
793 Bertrand	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
793B Bertrand	Moderate: seepage, slope.	Moderate: thin layer, piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
795D2 Ashgrove	Severe: slope.	Moderate: hard to pack, wetness.	Percs slowly, frost action, slope.	Wetness, percs slowly, rooting depth.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
834 Titus	Slight	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, rooting depth, percs slowly.
880B Clinton	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
893D2*: Gara	Severe: slope.	Slight	Deep to water	Slope	Slope	Slope.
Rinda	Severe: slope.	Severe: hard to pack.	Slope, percs slowly, frost action.	Wetness, percs slowly, slope.	Slope, wetness, erodes easily.	Wetness, slope, erodes easily.
950 Niota Variant	Slight	Severe: hard to pack, wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
950D Niota Variant	Severe: slope.	Severe: hard to pack, wetness.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Slope, wetness, percs slowly.	Wetness, slope, percs slowly.
960 Shaffton	Severe: seepage.	Severe: seepage, piping.	Deep to water	Favorable	Favorable	Favorable.
961 Ambraw	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
1273B, 1273C Olmitz Variant	Moderate: seepage, slope.	Slight	Deep to water	Slope	Favorable	Favorable.
1316*. Fluvaquents						
1587 Dolbee	Moderate: seepage.	Severe: wetness.	Flooding	Wetness	Wetness	Wetness.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1826---------- Snider	Moderate: seepage.	Severe: piping, wetness.	Favorable------	Wetness--------	Wetness--------	Wetness.
2208---------- Klum	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing, flooding.	Soil blowing---	Favorable.
2226---------- Elrin	Severe: seepage.	Severe: seepage, piping.	Deep to water	Favorable------	Too sandy------	Favorable.
2484---------- Lawson	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
4000*. Urban land						
5010*, 5030*. Pits						
5040*, 5080*. Orthents						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
41, 41B---------- Sparta	0-16	Loamy fine sand	SM	A-2, A-4	0	85-100	85-100	50-95	15-50	---	NP
	16-60	Loamy fine sand, fine sand, sand.	SP-SM, SM	A-2, A-3, A-4	0	85-100	85-100	50-95	5-50	---	NP
51---------- Vesser	0-13	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
	13-25	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
	25-60	Silty clay loam	CL	A-7	0	100	100	98-100	95-100	40-50	15-25
54---------- Zook	0-18	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	45-65	20-35
	18-60	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
56B---------- Cantril	0-24	Loam----------	CL	A-6	0	100	100	85-95	65-75	30-40	11-20
	24-60	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	70-88	35-45	15-25
58E---------- Douds	0-8	Loam----------	CL	A-6	0	95-100	85-100	70-90	60-80	25-35	10-20
	8-32	Clay loam, loam, sandy clay loam.	CL, SC	A-6, A-7	0	90-100	85-100	70-80	35-60	30-45	15-25
	32-60	Stratified loamy sand to clay loam.	SC, CL, SM-SC, CL-ML	A-4, A-6, A-2	0	90-100	85-100	65-85	20-60	15-35	5-15
65D2, 65E, 65E2, 65F, 65G-------- Lindley	0-11	Loam----------	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-95	50-65	15-30	5-15
	11-60	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	15-25
74---------- Rubio	0-8	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	100	95-100	25-40	5-15
	8-18	Silt loam--------	CL-ML, CL	A-4	0	100	100	100	95-100	25-35	5-10
	18-45	Silty clay, silty clay loam.	CH	A-7	0	100	100	100	95-100	55-70	30-40
	45-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	45-55	20-30
75---------- Givin	0-12	Silt loam--------	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	5-15
	12-42	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	45-60	25-35
	42-60	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	35-50	20-30
76B, 76C, 76C2--- Ladoga	0-11	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	100	95-100	25-40	5-15
	11-39	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	40-55	25-35
	39-60	Silty clay loam, silt loam.	CL	A-6	0	100	100	100	95-100	30-40	15-20
80B, 80C, 80C2, 80D, 80D2------- Clinton	0-12	Silt loam--------	ML	A-4	0	100	100	100	95-100	30-40	5-10
	12-39	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	40-55	25-35
	39-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
122---------- Sperry	0-10	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
	10-14	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
	14-49	Silty clay loam, silty clay.	CH	A-7	0	100	100	100	95-100	50-65	25-35
	49-60	Silty clay loam, silt loam.	CL	A-7	0	100	100	100	95-100	40-50	20-30
130---------- Belinda	0-8	Silt loam--------	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	5-15
	8-18	Silt loam--------	CL-ML, CL, ML	A-4	0	100	100	100	95-100	25-35	5-10
	18-31	Silty clay-------	CH	A-7	0	100	100	100	95-100	55-70	30-40
	31-60	Silty clay loam	CH	A-7	0	100	100	100	95-100	50-65	25-35

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
131B, 131C2------ Pershing	0-9	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
	9-37	Silty clay loam, silty clay.	CH	A-7	0	100	100	100	95-100	40-65	30-40
	37-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	100	95-100	35-55	20-35
132B, 132C, 132C2 Weller	0-9	Silt loam--------	ML, CL	A-6, A-4	0	100	100	100	95-100	30-40	5-15
	9-39	Silty clay loam, silty clay.	CH	A-7	0	100	100	100	95-100	50-65	30-40
	39-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	45-55	20-30
133, 133B-------- Colo	0-10	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-60	15-30
	10-47	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-55	20-30
	47-60	Silty clay loam, clay loam.	CL, CH	A-7	0	100	100	95-100	80-100	40-55	15-30
135-------------- Coland	0-35	Clay loam--------	CL, CH	A-7	0	100	100	95-100	65-80	45-55	20-30
	35-60	Clay loam, silty clay loam.	CL, CH	A-7	0	100	100	95-100	65-80	45-55	20-30
158-------------- Dorchester	0-60	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	95-100	90-95	25-35	5-10
163B, 163C, 163C2, 163D----- Fayette	0-14	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	14-47	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	47-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	10-20
172-------------- Wabash	0-7	Silty clay-------	CH	A-7	0	100	100	100	95-100	50-75	30-50
	7-60	Silty clay, clay	CH	A-7	0	100	100	100	95-100	52-78	30-55
173-------------- Hoopeston	0-25	Sandy loam-------	SM	A-2, A-4	0	90-100	90-100	70-90	25-45	20-35	NP-10
	25-60	Loamy sand, sand	SP-SM, SM, SC, SM-SC	A-2, A-3	0	90-100	90-100	50-80	5-20	<25	NP-10
174, 174B-------- Bolan	0-22	Loam-------------	CL, ML	A-4, A-6	0	100	100	85-95	50-70	30-40	5-15
	22-27	Loam-------------	CL, SC, CL-ML, SM-SC	A-4, A-6	0	100	100	80-90	40-55	25-35	5-15
	27-36	Fine sandy loam	SM, SM-SC, SC	A-4	0	100	100	80-90	35-50	15-25	2-8
	36-60	Loamy fine sand, fine sand.	SM, SP-SM	A-2	0	100	100	70-85	10-30	---	NP
175, 175B-------- Dickinson	0-16	Fine sandy loam	SM, SC, SM-SC	A-4, A-2	0	100	100	85-95	30-50	15-30	NP-10
	16-33	Fine sandy loam, sandy loam.	SM, SC, SM-SC	A-4	0	100	100	85-95	35-50	15-30	NP-10
	33-47	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	80-95	5-20	10-20	NP-5
	47-60	Sand, loamy fine sand, loamy sand.	SM, SP-SM	A-3, A-2	0	100	100	70-90	5-20	---	NP
179D2, 179E, 179E2----------- Gara	0-18	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	85-95	75-85	55-70	20-30	5-15
	18-47	Clay loam--------	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	47-60	Loam, clay loam	CL	A-6, A-7	0-5	90-95	85-95	70-85	55-75	35-45	15-25
180-------------- Keomah	0-18	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	18-40	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	45-60	30-45
	40-60	Silty clay loam	CL	A-7, A-6	0	100	100	100	95-100	35-50	20-30

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
208---------- Klum	0-8	Fine sandy loam	SM, ML, SC, CL	A-4	0	100	95-100	70-90	40-55	20-35	3-10
	8-60	Stratified silt loam to sandy loam.	SM, ML, SC, CL	A-4, A-2	0	100	95-100	70-95	10-70	<30	NP-10
220---------- Nodaway	0-60	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
222C---------- Clarinda	0-23	Silty clay loam	CL	A-7	0	100	95-100	90-100	85-100	40-50	20-30
	23-37	Silty clay, clay	CH	A-7	0	100	95-100	85-100	80-100	55-70	30-40
	37-60	Clay, silty clay	CH	A-7	0	95-100	95-100	80-95	75-90	55-70	35-45
223C2, 223D2----- Rinda	0-8	Silt loam---------	CL	A-6	0	100	95-100	90-100	85-100	30-40	10-20
	8-14	Silty clay loam	CL, CH	A-7	0	100	95-100	90-100	85-100	45-55	20-30
	14-60	Clay, silty clay	CH	A-7	0	95-100	95-100	80-95	75-90	55-70	35-45
263, 263B-------- Okaw	0-15	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	15-47	Silty clay, clay, silty clay loam.	ML, MH, CL, CH	A-7	0	100	95-100	95-100	90-100	40-60	15-25
	47-60	Silty clay loam, silty clay, clay.	ML, MH	A-7, A-6	0	100	100	95-100	90-100	35-55	10-25
279---------- Taintor	0-19	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	45-60	20-30
	19-45	Silty clay, silty clay loam.	CH	A-7	0	100	100	100	95-100	50-65	25-35
	45-60	Silty clay loam, silt loam.	CL	A-7	0	100	100	100	95-100	40-50	15-25
280---------- Mahaska	0-22	Silty clay loam	CL	A-7, A-6	0	100	100	100	95-100	35-50	15-25
	22-52	Silty clay loam, silty clay.	CH, MH	A-7	0	100	100	100	95-100	50-60	20-30
	52-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-20
281B, 281C2------ Otley	0-14	Silty clay loam	CL	A-7	0	100	100	100	95-100	40-50	15-25
	14-36	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	40-55	25-35
	36-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	20-30
291---------- Atterberry	0-13	Silt loam---------	CL-ML, CL	A-4, A-6	0	100	100	95-100	95-100	25-40	5-15
	13-60	Silty clay loam, silt loam.	CL, CH	A-7, A-6	0	100	100	95-100	95-100	35-55	20-30
362---------- Haig	0-8	Silt loam---------	CL, OL	A-6	0	100	100	100	95-100	30-40	10-20
	8-17	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	40-55	20-30
	17-31	Silty clay---------	CH	A-7	0	100	100	100	95-100	50-65	30-40
	31-60	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-55	20-30
364B---------- Grundy	0-14	Silty clay loam	CH, CL	A-7	0	100	100	95-100	90-100	40-55	20-35
	14-18	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	90-100	45-55	25-35
	18-36	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	90-100	50-70	30-45
	36-60	Silty clay loam	CH, CL	A-7	0	100	100	90-100	90-100	40-55	25-35
424D*, 424D2*: Lindley----------	0-11	Loam----------	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-95	50-65	15-30	5-15
	11-60	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	15-25
Keswick----------	0-8	Loam----------	CL, CL-ML	A-6, A-4	0-5	90-100	80-100	75-90	60-80	20-30	5-15
	8-35	Clay loam, clay	CH, MH	A-7	0-5	90-100	80-100	70-90	55-80	50-60	20-30
	35-60	Clay loam, sandy clay loam.	CL, SC	A-6	0-5	90-100	80-100	65-85	40-70	30-40	15-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
425D, 425D2------	0-8	Loam----------	CL, CL-ML	A-6, A-4	0-5	90-100	80-100	75-90	60-80	20-30	5-15
Keswick	8-35	Clay loam, clay	CH, MH	A-7	0-5	90-100	80-100	70-90	55-80	50-60	20-30
	35-60	Clay loam, sandy clay loam.	CL, SC	A-6	0-5	90-100	80-100	65-85	40-70	30-40	15-25
430----------	0-24	Silt loam--------	CL, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-50	8-20
Ackmore	24-60	Silty clay loam, silt loam.	CH, CL, MH, ML	A-7, A-6	0	100	100	95-100	85-100	35-60	15-30
453----------	0-18	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	98-100	95-100	25-35	5-15
Tuskeego	18-53	Silty clay loam, silty clay.	CH	A-7	0	100	100	98-100	95-100	50-60	25-35
	53-60	Silty clay loam	CH, CL, ML, MH	A-7	0	100	100	98-100	95-100	45-55	25-35
478G*:											
Nordness--------	0-6	Silt loam--------	CL, CL-ML	A-4	0	100	100	90-100	70-90	20-30	5-10
	6-15	Loam, clay loam	CL	A-7, A-6	2-10	80-95	75-90	60-85	55-80	30-50	20-30
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
484----------	0-34	Silt loam--------	CL, CL-ML	A-4	0	100	100	90-100	80-100	20-30	5-10
Lawson	34-60	Silty clay loam, silt loam.	CL	A-6	0	100	100	90-100	80-100	20-40	10-25
499F----------	0-6	Silt loam--------	CL, CL-ML	A-4	0	100	100	90-100	70-90	20-30	5-10
Nordness	6-15	Loam, clay loam	CL	A-7, A-6	2-10	80-95	75-90	60-85	55-80	30-50	20-30
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
520----------	0-8	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
Coppock	8-25	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	10-20
	25-41	Silty clay loam	CL, CH, ML, MH	A-6, A-7	0	100	100	98-100	95-100	35-55	15-25
	41-60	Silty clay loam	CL, CH	A-7	0	100	100	98-100	95-100	40-60	15-30
570B, 570C2------	0-16	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	40-55	15-25
Nira	16-46	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	40-55	20-30
	46-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
571B, 571C2------	0-12	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	100	95-100	25-40	5-15
Hedrick	12-45	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	40-55	25-35
	45-60	Silty clay loam, silt loam.	CL	A-6	0	100	100	100	95-100	30-40	15-20
572B, 572C2------	0-8	Silt loam--------	ML	A-4	0	100	100	100	95-100	30-40	5-10
Inton	8-39	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	40-55	25-35
	39-60	Silty clay loam, silt loam.	CL	A-6	0	100	100	100	95-100	30-40	15-25
730B*:											
Nodaway---------	0-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
Cantril---------	0-24	Loam----------	CL	A-6	0	100	100	85-95	65-75	30-40	11-20
	24-60	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	70-88	35-45	15-25
Klum----------	0-8	Fine sandy loam	SM, ML, SC, CL	A-4	0	100	95-100	70-90	40-55	20-35	3-10
	8-60	Stratified silt loam to sandy loam.	SM, ML, SC, CL	A-4, A-2	0	100	95-100	70-95	10-70	<30	NP-10

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
779----------	0-18	Silty clay loam	MH	A-7	0	100	100	100	95-100	50-65	20-30
Kalona	18-41	Silty clay loam, silty clay.	CH	A-7	0	100	100	100	95-100	50-65	25-35
	41-60	Silty clay loam, silt loam.	CL	A-7	0	100	100	100	95-100	40-50	15-25
793, 793B--------	0-15	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	25-35	3-10
Bertrand	15-33	Silt loam, silty clay loam.	CL	A-6, A-4	0	100	100	90-100	80-95	25-40	7-20
	33-60	Stratified silt loam to loamy sand.	ML, SM, CL, SC	A-4	0	100	100	80-95	35-75	<25	2-10
795D2----------	0-16	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	85-100	35-45	15-25
Ashgrove	16-51	Silty clay, silty clay loam.	CH	A-7	0	100	95-100	85-100	85-100	55-70	30-40
	51-60	Clay----------	CH	A-7	0	95-100	95-100	75-90	75-90	50-60	25-35
834----------	0-22	Silty clay loam	CH, CL	A-7	0	100	100	95-100	90-100	40-55	20-30
Titus	22-60	Stratified silty clay loam to sand.	CL, SM, SC, ML	A-6, A-4, A-2	0	100	90-100	50-90	15-85	<35	NP-25
880B----------	0-12	Silt loam--------	ML	A-4	0	100	100	100	95-100	30-40	5-10
Clinton	12-39	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	40-55	25-35
	39-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
893D2*:											
Gara----------	0-18	Loam----------	CL, CL-ML	A-4, A-6	0	95-100	85-95	75-85	55-70	20-30	5-15
	18-47	Clay loam--------	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	47-60	Loam, clay loam	CL	A-6, A-7	0-5	90-95	85-95	70-85	55-75	35-45	15-25
Rinda----------	0-8	Silt loam--------	CL	A-6	0	100	95-100	90-100	85-100	30-40	10-20
	8-14	Silty clay loam	CL, CH	A-7	0	100	95-100	90-100	85-100	45-55	20-30
	14-60	Clay, silty clay	CH	A-7	0	95-100	95-100	80-95	75-90	55-70	35-45
950, 950D--------	0-7	Silty clay loam	CL	A-6	0	100	100	95-100	90-100	30-40	10-20
Niota Variant	7-60	Silty clay, clay	CH	A-7	0	100	100	95-100	95-100	50-80	25-45
960----------	0-12	Loam----------	CL	A-6	0	100	100	85-95	60-70	30-40	11-20
Shaffton	12-23	Loam----------	CL, CL-ML	A-4, A-6	0	100	100	85-95	55-65	25-35	5-15
	23-42	Loamy fine sand, fine sandy loam.	SM, SM-SC, SC	A-4	0	100	100	75-95	40-60	<20	NP-10
	42-60	Fine sand, sand.	SM, SP, SP-SM	A-2, A-3	0	85-100	85-100	50-95	2-30	---	NP
961----------	0-20	Loam----------	ML, CL	A-6, A-7	0	100	100	85-95	70-95	35-45	10-18
Ambraw	20-50	Clay loam, sandy clay loam.	ML, CL	A-7, A-6	0	100	100	85-95	50-85	35-48	10-20
	50-60	Stratified silty clay loam to sandy loam.	SC, ML, CL, SM	A-6, A-4	0	100	90-100	80-90	40-80	20-40	NP-17
1273B, 1273C-----	0-26	Loam----------	CL	A-6	0	100	90-100	85-95	60-80	30-40	11-20
Olmitz Variant	26-60	Clay loam--------	CL	A-6, A-7	0	100	90-100	85-95	60-80	35-45	15-25
1316*. Fluvaquents											
1587----------	0-18	Silt loam--------	CL	A-6, A-7	0	100	100	90-100	80-90	35-50	15-25
Dolbee	18-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-90	35-50	20-30
1826----------	0-18	Loam----------	ML, CL	A-4, A-6	0	100	100	85-95	50-70	30-40	5-15
Snider	18-54	Loam, silt loam	ML, CL	A-4, A-6	0	100	100	85-95	50-70	30-40	5-15
	54-60	Silty clay loam, loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	100	80-95	50-75	25-40	5-15

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
2208---------- Klum	0-8	Fine sandy loam	SM, ML, SC, CL	A-4	0	100	95-100	70-90	40-55	20-35	3-10
	8-60	Stratified silt loam to sandy loam.	SM, ML, SC, CL	A-4, A-2	0	100	95-100	70-95	10-70	<30	NP-10
2226---------- Elrin	0-20	Loam----------	CL, ML	A-4, A-6	0	100	100	85-95	50-70	30-40	5-15
	20-27	Loam----------	CL, SC, CL-ML, SM-SC	A-4, A-6	0	100	100	80-90	40-55	25-35	5-15
	27-41	Sandy loam, fine sandy loam.	SM, SM-SC, SC	A-4	0	100	100	80-90	35-50	15-25	2-8
	41-60	Loamy sand, loamy fine sand.	SM, SP-SM	A-2	0	100	100	70-85	10-30	---	NP
2484---------- Lawson	0-34	Silt loam--------	CL, CL-ML	A-4	0	100	100	90-100	80-100	20-30	5-10
	34-60	Silty clay loam, silt loam.	CL	A-6	0	100	100	90-100	80-100	20-40	10-25
4000*. Urban land											
5010*, 5030*. Pits											
5040*, 5080*. Orthents											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				
41, 41B----------	0-16	3-10	1.20-1.40	2.0-6.0	0.09-0.12	5.1-7.3	Low----------	0.17	5	2
Sparta	16-60	1-8	1.40-1.60	6.0-20	0.05-0.11	5.1-6.5	Low----------	0.17		
51----------	0-13	20-26	1.30-1.35	0.6-2.0	0.20-0.24	5.6-7.3	Moderate-----	0.32	5	7
Vesser	13-25	18-22	1.35-1.40	0.6-2.0	0.18-0.22	5.1-6.0	Moderate-----	0.43		
	25-60	30-35	1.40-1.45	0.6-2.0	0.17-0.21	5.6-6.5	Moderate-----	0.43		
54----------	0-18	32-38	1.30-1.35	0.2-0.6	0.21-0.23	5.6-7.3	High---------	0.28	5	7
Zook	18-60	36-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.8	High---------	0.28		
56B----------	0-24	14-27	1.40-1.45	0.6-2.0	0.17-0.19	5.1-7.3	Low----------	0.32	5	6
Cantril	24-60	27-35	1.45-1.75	0.6-2.0	0.14-0.16	5.1-6.5	Moderate-----	0.32		
58E----------	0-8	20-27	1.45-1.50	0.6-2.0	0.15-0.17	5.1-7.3	Low----------	0.32	5	6
Douds	8-32	26-35	1.45-1.65	0.6-2.0	0.15-0.17	4.5-6.0	Moderate-----	0.32		
	32-60	5-30	1.55-1.75	0.6-6.0	0.11-0.13	5.1-6.0	Low----------	0.32		
65D2, 65E, 65E2,	0-11	18-27	1.20-1.40	0.6-2.0	0.16-0.18	4.5-7.3	Low----------	0.32	5	6
65F, 65G---------	11-60	25-35	1.35-1.55	0.2-0.6	0.14-0.18	4.5-6.5	Moderate-----	0.32		
Lindley										
74----------	0-8	16-22	1.35-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	6
Rubio	8-18	16-22	1.40-1.45	0.6-2.0	0.20-0.22	5.1-6.0	Low----------	0.37		
	18-45	35-42	1.45-1.50	0.06-0.2	0.12-0.18	5.1-6.0	High---------	0.37		
	45-60	32-40	1.50-1.55	0.2-0.6	0.18-0.20	5.1-7.3	High---------	0.37		
75----------	0-12	18-26	1.30-1.40	0.6-2.0	0.22-0.24	5.6-6.0	Moderate-----	0.32	5	6
Givin	12-42	36-42	1.30-1.45	0.2-0.6	0.18-0.20	5.1-6.0	Moderate-----	0.43		
	42-60	27-34	1.40-1.50	0.2-0.6	0.18-0.20	5.1-6.0	Moderate-----	0.43		
76B, 76C, 76C2---	0-11	18-27	1.30-1.35	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.32	5	6
Ladoga	11-39	36-42	1.30-1.40	0.6-2.0	0.18-0.20	5.1-6.0	Moderate-----	0.43		
	39-60	24-32	1.35-1.45	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.43		
80B, 80C, 80C2,										
80D, 80D2--------	0-12	16-26	1.30-1.40	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37	5	6
Clinton	12-39	36-42	1.35-1.45	0.2-0.6	0.16-0.20	5.1-6.0	Moderate-----	0.37		
	39-60	24-35	1.40-1.55	0.6-2.0	0.18-0.20	5.6-6.5	Moderate-----	0.37		
122----------	0-10	18-22	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.28	5	6
Sperry	10-14	18-22	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.28		
	14-49	38-45	1.40-1.45	0.06-0.2	0.14-0.16	5.1-6.5	High---------	0.43		
	49-60	26-34	1.45-1.50	0.2-0.6	0.19-0.21	5.6-6.5	High---------	0.43		
130----------	0-8	16-22	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	4	6
Belinda	8-18	18-27	1.30-1.35	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37		
	18-31	42-52	1.30-1.45	<0.06	0.12-0.14	4.5-5.5	High---------	0.28		
	31-60	28-40	1.40-1.50	0.06-0.6	0.18-0.20	5.1-6.0	High---------	0.28		
131B, 131C2------	0-9	20-27	1.30-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.37	3	6
Pershing	9-37	28-48	1.30-1.45	0.06-0.2	0.18-0.20	5.1-6.0	High---------	0.37		
	37-60	24-40	1.35-1.50	0.2-0.6	0.18-0.20	5.1-6.5	High---------	0.37		
132B, 132C, 132C2	0-9	16-27	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	3	6
Weller	9-39	28-48	1.35-1.50	0.06-0.2	0.12-0.18	4.5-6.0	High---------	0.43		
	39-60	28-40	1.40-1.55	0.2-0.6	0.18-0.20	5.1-6.0	High---------	0.43		

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				
133, 133B-------- Colo	0-10 10-47 47-60	27-32 30-35 30-35	1.28-1.32 1.25-1.35 1.35-1.45	0.6-2.0 0.6-2.0 0.6-2.0	0.21-0.23 0.18-0.20 0.18-0.20	5.6-7.3 6.1-7.3 6.1-7.3	High--------- High--------- High---------	0.28 0.28 0.28	5	7
135-------------- Coland	0-35 35-60	27-35 27-35	1.40-1.50 1.40-1.50	0.6-2.0 0.6-2.0	0.20-0.22 0.20-0.22	5.6-7.3 6.1-7.3	High--------- High---------	0.28 0.28	5	7
158-------------- Dorchester	0-60	18-24	1.20-1.30	0.6-2.0	0.20-0.22	7.4-7.8	Low----------	0.37	5	6
163B, 163C, 163C2, 163D----- Fayette	0-14 14-47 47-60	15-25 30-35 22-26	1.30-1.35 1.30-1.45 1.45-1.50	0.6-2.0 0.6-2.0 0.6-2.0	0.20-0.22 0.18-0.20 0.18-0.20	5.1-7.3 4.5-6.0 5.1-7.8	Low---------- Moderate----- Moderate-----	0.37 0.37 0.37	5	6
172-------------- Wabash	0-7 7-60	40-46 40-60	1.25-1.45 1.20-1.45	<0.06 <0.06	0.12-0.14 0.08-0.12	5.6-7.3 5.6-7.8	Very high---- Very high----	0.28 0.28	5	4
173-------------- Hoopeston	0-25 25-60	8-18 2-10	1.35-1.70 1.50-1.80	2.0-6.0 6.0-20	0.12-0.15 0.05-0.10	5.1-6.5 5.6-7.8	Low---------- Low----------	0.28 0.28	4	3
174, 174B-------- Bolan	0-22 22-27 27-36 36-60	20-26 14-20 10-15 2-8	1.40-1.45 1.45-1.50 1.50-1.60 1.60-1.70	0.6-2.0 0.6-2.0 2.0-6.0 6.0-20	0.20-0.22 0.17-0.19 0.11-0.13 0.08-0.10	5.6-7.3 5.6-6.5 6.1-7.3 6.1-7.3	Low---------- Low---------- Low---------- Low----------	0.28 0.28 0.28 0.17	4	6
175, 175B-------- Dickinson	0-16 16-33 33-47 47-60	12-18 10-15 5-10 5-10	1.50-1.55 1.45-1.55 1.55-1.65 1.60-1.70	2.0-6.0 2.0-6.0 6.0-20 6.0-20	0.12-0.15 0.12-0.15 0.08-0.10 0.02-0.04	5.6-7.3 5.1-6.5 5.1-6.5 5.6-6.5	Low---------- Low---------- Low---------- Low----------	0.20 0.20 0.20 0.15	4	3
179D2, 179E, 179E2---------- Gara	0-18 18-37 47-60	24-27 30-38 24-38	1.50-1.55 1.55-1.75 1.75-1.85	0.6-2.0 0.2-0.6 0.2-0.6	0.20-0.22 0.16-0.18 0.16-0.18	5.6-7.3 4.5-6.5 6.6-7.8	Moderate----- Moderate----- Moderate-----	0.28 0.28 0.37	5	6
180-------------- Keomah	0-18 18-40 40-60	16-22 27-42 27-38	1.30-1.40 1.30-1.45 1.40-1.55	0.6-2.0 0.2-0.6 0.2-0.6	0.22-0.24 0.18-0.20 0.18-0.20	5.6-7.3 4.5-5.5 5.1-6.5	Low---------- High--------- Moderate-----	0.37 0.37 0.37	5	6
208-------------- Klum	0-8 8-60	5-18 5-18	1.50-1.60 1.50-1.60	2.0-6.0 2.0-6.0	0.15-0.18 0.13-0.18	6.1-7.3 6.1-7.3	Low---------- Low----------	0.20 0.20	5	3
220-------------- Nodaway	0-60	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate-----	0.37	5	6
222C------------- Clarinda	0-23 23-37 37-60	30-38 40-60 40-60	1.45-1.50 1.45-1.60 1.55-1.75	0.2-0.6 <0.06 <0.06	0.17-0.19 0.14-0.16 0.14-0.16	5.1-7.3 5.1-6.5 5.6-7.3	Moderate----- High--------- High---------	0.37 0.37 0.37	3	7
223C2, 223D2----- Rinda	0-8 8-14 14-60	22-27 30-40 40-60	1.45-1.50 1.45-1.50 1.45-1.75	0.6-2.0 0.2-0.6 <0.6	0.22-0.24 0.18-0.20 0.14-0.16	5.6-7.3 5.1-6.5 5.1-7.3	Moderate----- High--------- High---------	0.43 0.43 0.32	3	6
263, 263B-------- Okaw	0-15 15-47 47-60	20-27 35-48 27-42	1.20-1.40 1.35-1.60 1.45-1.70	0.2-0.6 <0.06 <0.06	0.22-0.24 0.09-0.18 0.08-0.20	4.5-6.5 3.6-6.0 5.6-7.3	Low---------- High--------- High---------	0.43 0.32 0.32	3	6
279-------------- Taintor	0-19 19-45 45-60	30-36 35-44 24-34	1.30-1.40 1.30-1.45 1.40-1.50	0.2-0.6 0.2-0.6 0.6-2.0	0.21-0.23 0.14-0.18 0.18-0.20	5.6-7.3 5.6-6.5 6.1-7.8	Moderate----- High--------- Moderate-----	0.28 0.43 0.43	5	7
280-------------- Mahaska	0-22 22-52 52-60	20-32 36-42 24-32	1.30-1.40 1.30-1.45 1.40-1.45	0.6-2.0 0.6-2.0 0.6-2.0	0.21-0.23 0.14-0.18 0.18-0.20	5.1-7.3 4.5-6.0 5.6-7.3	Moderate----- Moderate----- Moderate-----	0.32 0.43 0.43	5	7

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				
281B, 281C2--------	0-14	28-34	1.25-1.35	0.6-2.0	0.21-0.23	5.1-7.3	Moderate------	0.32	5	7
Otley	14-36	34-42	1.30-1.40	0.6-2.0	0.18-0.20	5.1-6.0	Moderate------	0.43		
	36-60	24-35	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate------	0.43		
291----------------	0-13	20-26	1.20-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.32	5	6
Atterberry	13-60	25-35	1.30-1.50	0.6-2.0	0.18-0.20	5.1-6.5	Moderate------	0.43		
362----------------	0-8	22-27	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Moderate------	0.37	5	6
Haig	8-17	28-48	1.30-1.35	0.6-2.0	0.21-0.23	5.1-7.3	High----------	0.37		
	17-31	40-50	1.30-1.45	<0.2	0.12-0.14	5.1-7.3	High----------	0.37		
	31-60	28-40	1.40-1.50	0.2-0.6	0.18-0.20	6.1-7.3	High----------	0.37		
364B----------------	0-14	28-32	1.35-1.45	0.2-0.6	0.18-0.20	5.6-7.3	High----------	0.37	2	6
Grundy	14-18	32-45	1.35-1.45	0.2-0.6	0.18-0.20	5.6-6.5	High----------	0.37		
	18-36	40-50	1.30-1.40	0.06-0.2	0.11-0.13	5.1-7.3	High----------	0.37		
	36-60	28-35	1.35-1.40	0.06-0.2	0.18-0.20	5.6-7.3	High----------	0.37		
424D*, 424D2*:										
Lindley----------	0-11	18-27	1.20-1.40	0.6-2.0	0.16-0.18	4.5-7.3	Low-----------	0.32	5	6
	11-60	25-35	1.35-1.55	0.2-0.6	0.14-0.18	4.5-6.5	Moderate------	0.32		
Keswick----------	0-8	22-27	1.45-1.50	0.6-2.0	0.17-0.22	4.5-7.3	Moderate------	0.37	3	6
	8-35	35-48	1.45-1.60	0.06-0.2	0.11-0.15	4.5-6.0	High----------	0.37		
	35-60	30-48	1.60-1.80	0.2-0.6	0.12-0.16	4.5-6.0	Moderate------	0.37		
425D, 425D2------	0-8	22-27	1.45-1.50	0.6-2.0	0.17-0.22	4.5-7.3	Moderate------	0.37	3	6
Keswick	8-35	35-48	1.45-1.60	0.06-0.2	0.11-0.15	4.5-6.0	High----------	0.37		
	35-60	30-48	1.60-1.80	0.2-0.6	0.12-0.16	4.5-6.0	Moderate------	0.37		
430----------------	0-24	25-30	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate------	0.37	5	6
Ackmore	24-60	26-35	1.30-1.40	0.6-2.0	0.18-0.20	5.6-7.8	High----------	0.37		
453----------------	0-18	16-22	1.35-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Moderate------	0.32	3	7
Tuskeego	18-53	32-48	1.30-1.45	<0.06	0.13-0.17	5.1-6.0	High----------	0.32		
	53-60	28-40	1.40-1.50	0.06-0.2	0.16-0.19	5.6-6.5	Moderate------	0.32		
478G*:										
Nordness---------	0-6	18-24	1.30-1.35	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.43	2	6
	6-15	25-35	1.35-1.60	0.6-2.0	0.12-0.15	6.6-7.3	High----------	0.43		
	15	---	---	---	---	---	----------	----		
Rock outcrop.										
484----------------	0-34	10-20	1.20-1.55	0.6-2.0	0.22-0.24	6.1-7.8	Low-----------	0.32	5	5
Lawson	34-60	18-30	1.55-1.65	0.6-2.0	0.18-0.20	6.1-7.8	Moderate------	0.43		
499F----------------	0-6	18-24	1.30-1.35	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.43	2	6
Nordness	6-15	25-35	1.35-1.60	0.6-2.0	0.12-0.15	6.6-7.3	High----------	0.43		
	15	---	---	---	---	---	----------	----		
520----------------	0-8	16-26	1.30-1.35	0.6-2.0	0.20-0.24	6.1-7.3	Moderate------	0.32	5	7
Coppock	8-19	16-27	1.30-1.40	0.6-2.0	0.18-0.22	5.6-7.3	Moderate------	0.43		
	19-41	27-35	1.30-1.40	0.6-2.0	0.17-0.21	4.5-6.0	Moderate------	0.43		
	41-60	27-40	1.40-1.45	0.6-2.0	0.15-0.19	4.5-6.0	Moderate------	0.43		
570B, 570C2------	0-16	28-34	1.25-1.40	0.6-2.0	0.21-0.23	5.6-7.3	Moderate------	0.32	5	7
Nira	16-46	30-35	1.25-1.40	0.6-2.0	0.18-0.20	5.1-6.0	Moderate------	0.43		
	46-60	24-34	1.35-1.45	0.6-2.0	0.18-0.20	5.6-6.5	Moderate------	0.43		
571B, 571C2------	0-12	16-27	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Low-----------	0.32	5	6
Hedrick	12-45	27-37	1.30-1.45	0.6-2.0	0.18-0.20	5.1-6.5	Moderate------	0.43		
	45-60	24-32	1.40-1.45	0.6-2.0	0.18-0.20	5.6-7.8	Moderate------	0.43		
572B, 572C2------	0-8	22-27	1.30-1.40	0.6-2.0	0.20-0.22	5.1-7.3	Low-----------	0.37	5	6
Inton	8-39	27-35	1.35-1.45	0.6-2.0	0.18-0.20	5.1-6.5	Moderate------	0.37		
	39-60	25-32	1.30-1.40	0.6-2.0	0.18-0.20	5.1-7.3	Moderate------	0.37		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				
730B*:										
Nodaway	0-60	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate	0.37	5	6
Cantril	0-24	14-27	1.40-1.45	0.6-2.0	0.17-0.19	5.1-7.3	Low	0.32	5	6
	24-60	27-35	1.45-1.75	0.6-2.0	0.14-0.16	5.1-6.5	Moderate	0.32		
Klum	0-8	5-18	1.50-1.60	2.0-6.0	0.15-0.18	6.1-7.3	Low	0.20	5	3
	8-60	5-18	1.50-1.60	2.0-6.0	0.13-0.18	6.1-7.3	Low	0.20		
779	0-18	36-39	1.35-1.40	0.2-0.6	0.18-0.20	5.6-7.3	High	0.28	5	7
Kalona	18-41	36-42	1.40-1.45	0.2-0.6	0.14-0.18	5.6-7.3	High	0.37		
	41-60	26-34	1.45-1.50	0.2-0.6	0.18-0.20	6.1-7.8	Moderate	0.37		
793, 793B	0-15	15-22	1.35-1.60	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	5	5
Bertrand	15-33	18-30	1.55-1.65	0.6-2.0	0.18-0.22	5.1-6.5	Moderate	0.37		
	33-60	10-20	1.55-1.65	0.6-6.0	0.09-0.22	5.1-6.5	Low	0.37		
795D2	0-16	27-40	1.45-1.50	0.2-0.6	0.18-0.20	4.5-7.3	Moderate	0.43	2	7
Ashgrove	16-51	35-45	1.45-1.50	<0.06	0.12-0.14	5.1-6.5	High	0.32		
	51-60	40-60	1.45-1.75	<0.06	0.12-0.14	5.6-7.3	High	0.32		
834	0-22	35-45	1.30-1.50	0.06-0.2	0.11-0.22	6.1-7.8	High	0.32	4	4
Titus	22-60	5-30	1.45-1.75	0.2-0.6	0.05-0.09	6.1-7.8	Low	0.32		
880B	0-12	16-26	1.30-1.40	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.37	5	6
Clinton	12-39	36-42	1.35-1.45	0.2-0.6	0.16-0.20	5.1-6.0	Moderate	0.37		
	39-60	24-35	1.40-1.55	0.6-2.0	0.18-0.20	6.1-6.5	Moderate	0.37		
893D2*:										
Gara	0-18	24-27	1.50-1.55	0.6-2.0	0.20-0.22	5.6-7.3	Moderate	0.28	5	6
	18-47	30-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-6.5	Moderate	0.28		
	47-60	24-38	1.75-1.85	0.2-0.6	0.16-0.18	6.6-7.8	Moderate	0.37		
Rinda	0-8	22-27	1.45-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Moderate	0.43	3	6
	8-14	30-40	1.45-1.50	0.2-0.6	0.18-0.20	5.1-6.5	High	0.43		
	14-60	40-60	1.45-1.75	<0.6	0.14-0.16	5.1-7.3	High	0.32		
950, 950D	0-7	30-40	1.20-1.35	0.2-0.6	0.17-0.20	5.1-7.3	Moderate	0.28	3	6
Niota Variant	7-60	40-60	1.40-1.60	<0.06	0.09-0.13	5.1-7.3	High	0.28		
960	0-12	20-30	1.45-1.55	0.6-2.0	0.20-0.22	5.1-7.3	Moderate	0.24	5	6
Shaffton	12-23	18-26	1.55-1.65	0.6-2.0	0.17-0.19	4.5-6.0	Moderate	0.32		
	23-42	8-16	1.65-1.70	6.0-20	0.05-0.08	4.5-6.0	Low	0.17		
	42-60	2-6	1.65-1.75	>20	0.03-0.05	6.1-7.3	Very low	0.15		
961	0-20	25-35	1.40-1.60	0.6-2.0	0.17-0.23	5.6-7.3	Moderate	0.28	5	6
Ambraw	20-50	24-35	1.45-1.65	0.2-2.0	0.15-0.19	5.6-7.3	Moderate	0.28		
	50-60	18-30	1.50-1.70	0.2-2.0	0.11-0.22	6.1-8.4	Low	0.28		
1273B, 1273C	0-26	24-30	1.40-1.45	0.6-2.0	0.19-0.21	6.6-7.8	Moderate	0.28	5	6
Olmitz Variant	26-60	28-34	1.45-1.55	0.6-2.0	0.15-0.17	6.6-7.8	Moderate	0.28		
1316*. Fluvaquents										
1587	0-18	20-30	1.25-1.30	0.6-2.0	0.22-0.24	6.1-7.3	Moderate	0.28	5	6
Dolbee	18-60	25-34	1.25-1.30	0.6-2.0	0.22-0.24	6.1-7.3	Moderate	0.28		
1826	0-18	14-25	1.40-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.32	5	6
Snider	18-54	18-25	1.40-1.50	0.6-2.0	0.17-0.19	5.6-6.5	Low	0.32		
	54-60	10-35	1.50-1.60	0.6-2.0	0.18-0.22	5.6-6.5	Low	0.32		
2208	0-8	5-18	1.50-1.60	2.0-6.0	0.15-0.18	6.1-7.3	Low	0.20	5	3
Klum	8-60	5-18	1.50-1.60	2.0-6.0	0.13-0.18	6.1-7.3	Low	0.20		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				
2226----------	0-20	16-25	1.40-1.45	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.28	4	6
Elrin	20-27	14-22	1.45-1.50	0.6-2.0	0.17-0.19	5.1-6.5	Low----------	0.28		
	27-41	8-18	1.50-1.60	2.0-6.0	0.11-0.13	5.1-6.5	Low----------	0.28		
	41-60	4-10	1.60-1.70	6.0-20	0.08-0.10	5.1-6.5	Low----------	0.17		
2484----------	0-34	10-20	1.20-1.55	0.6-2.0	0.22-0.24	6.1-7.8	Low----------	0.32	5	5
Lawson	34-60	18-30	1.55-1.65	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.43		
4000*. Urban land										
5010*, 5030*. Pits										
5040*, 5080*. Orthents										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
41, 41B---------- Sparta	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Moderate.
51---------- Vesser	C	Rare--------	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
54---------- Zook	C/D	Rare--------	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
56B---------- Cantril	B	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	Moderate	Low.
58E---------- Douds	B	None--------	---	---	4.0-6.0	Apparent	Nov-Jul	>60	---	Moderate	Moderate	Moderate.
65D2, 65E, 65E2, 65F, 65G--------- Lindley	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
74---------- Rubio	C/D	None--------	---	---	0-1.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
75---------- Givin	C	None--------	---	---	2.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
76B, 76C, 76C2---- Ladoga	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
80B, 80C, 80C2, 80D, 80D2-------- Clinton	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
122---------- Sperry	C/D	None--------	---	---	+1-1.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
130---------- Belinda	D	None--------	---	---	0.5-2.0	Apparent	Nov-Jul	>60	---	Moderate	High-----	Moderate.
131B, 131C2------- Pershing	C	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
132B, 132C, 132C2- Weller	C	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	High.
133, 133B--------- Colo	B/D	Occasional	Very brief	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
135---------- Coland	B/D	Rare--------	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Low.
158---------- Dorchester	B	Rare--------	---	---	>6.0	---	---	>60	---	High-----	High-----	Low.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
163B, 163C, 163C2, 163D---------- Fayette	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
172---------- Wabash	D	Rare--------	---	---	0-1.0	Apparent	Nov-Jul	>60	---	Moderate	High-----	Moderate.
173---------- Hoopeston	B	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	Low------	Moderate.
174, 174B---------- Bolan	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
175, 175B---------- Dickinson	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
179D2, 179E, 179E2---------- Gara	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
180---------- Keomah	C	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
208---------- Klum	B	Frequent----	Brief-----	Mar-Nov	3.0-6.0	Apparent	Nov-Jul	>60	---	Moderate	Low------	Low.
220---------- Nodaway	B	Occasional	Very brief to brief.	Feb-Nov	3.0-5.0	Apparent	Apr-Jul	>60	---	High-----	Moderate	Low.
222C---------- Clarinda	D	None--------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High-----	High-----	Moderate.
223C2, 223D2------ Rinda	D	None--------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High-----	High-----	Moderate.
263, 263B---------- Okaw	D	Rare--------	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High-----	High-----	High.
279---------- Taintor	C/D	None--------	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
280---------- Mahaska	B	None--------	---	---	2.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
281B, 281C2------- Otley	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
291---------- Atterberry	B	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
362---------- Haig	C/D	None--------	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
364B---------- Grundy	C	None--------	---	---	1.0-3.0	Perched	Mar-May	>60	---	High-----	High-----	Moderate.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
424D*, 424D2*: Lindley	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Keswick	D	None	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High	High	Moderate.
425D, 425D2 Keswick	D	None	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High	High	Moderate.
430 Ackmore	B	Rare	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Low.
453 Tuskeego	C/D	Rare	---	---	0-1.0	Apparent	Nov-Jul	>60	---	Moderate	High	Moderate.
478G*: Nordness	B	None	---	---	>6.0	---	---	8-20	Hard	Low	Low	Low.
Rock outcrop.												
484 Lawson	C	Occasional	Brief	Mar-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	Moderate	Low.
499F Nordness	B	None	---	---	>6.0	---	---	8-20	Hard	Low	Low	Low.
520 Coppock	B	Occasional	Brief	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
570B, 570C2 Nira	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
571B, 571C2 Hedrick	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
572B, 572C2 Inton	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
730B*: Nodaway	B	Occasional	Very brief to brief.	Feb-Nov	3.0-5.0	Apparent	Apr-Jul	>60	---	High	Moderate	Low.
Cantril	B	Rare	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	Moderate	Low.
Klum	B	Frequent	Brief	Mar-Nov	3.0-6.0	Apparent	Nov-Jul	>60	---	Moderate	Low	Low.
779 Kalona	C	None	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
793, 793B Bertrand	B	None	---	---	>6.0	---	---	>60	---	High	Low	Moderate.
795D2 Ashgrove	D	None	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High	High	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
834--- Titus	B/D	Rare	---	---	0-2.0	Apparent	Mar-Jun	>60	---	High	High	Low.
880B--- Clinton	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
893D2*:												
Gara---	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Rinda---	D	None	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High	High	Moderate.
950, 950D--- Niota Variant	D	None	---	---	0-2.0	Perched	Mar-Jun	>60	---	High	High	High.
960--- Shaffton	B	Rare	---	---	3.0-5.0	Apparent	Nov-Jul	>60	---	Moderate	High	High.
961--- Ambraw	B/D	Frequent	Brief	Mar-Jun	0-2.0	Apparent	Mar-Jun	>60	---	High	High	Moderate.
1273B, 1273C--- Olmitz Variant	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
1316*. Fluvaquents												
1587--- Dolbee	C	Rare	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Low.
1826--- Snider	C	None	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	Moderate	Moderate	Moderate.
2208--- Klum	B	Frequent	Brief	Mar-Nov	3.0-6.0	Apparent	Nov-Jul	>60	---	Moderate	Low	Low.
2226--- Elrin	B	None	---	---	3.0-5.0	Apparent	Nov-Jul	>60	---	High	Moderate	Moderate.
2484--- Lawson	C	Frequent	Brief	Mar-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	Moderate	Low.
4000*. Urban land												
5010*, 5030*. Pits												
5040*, 5080*. Orthents												

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

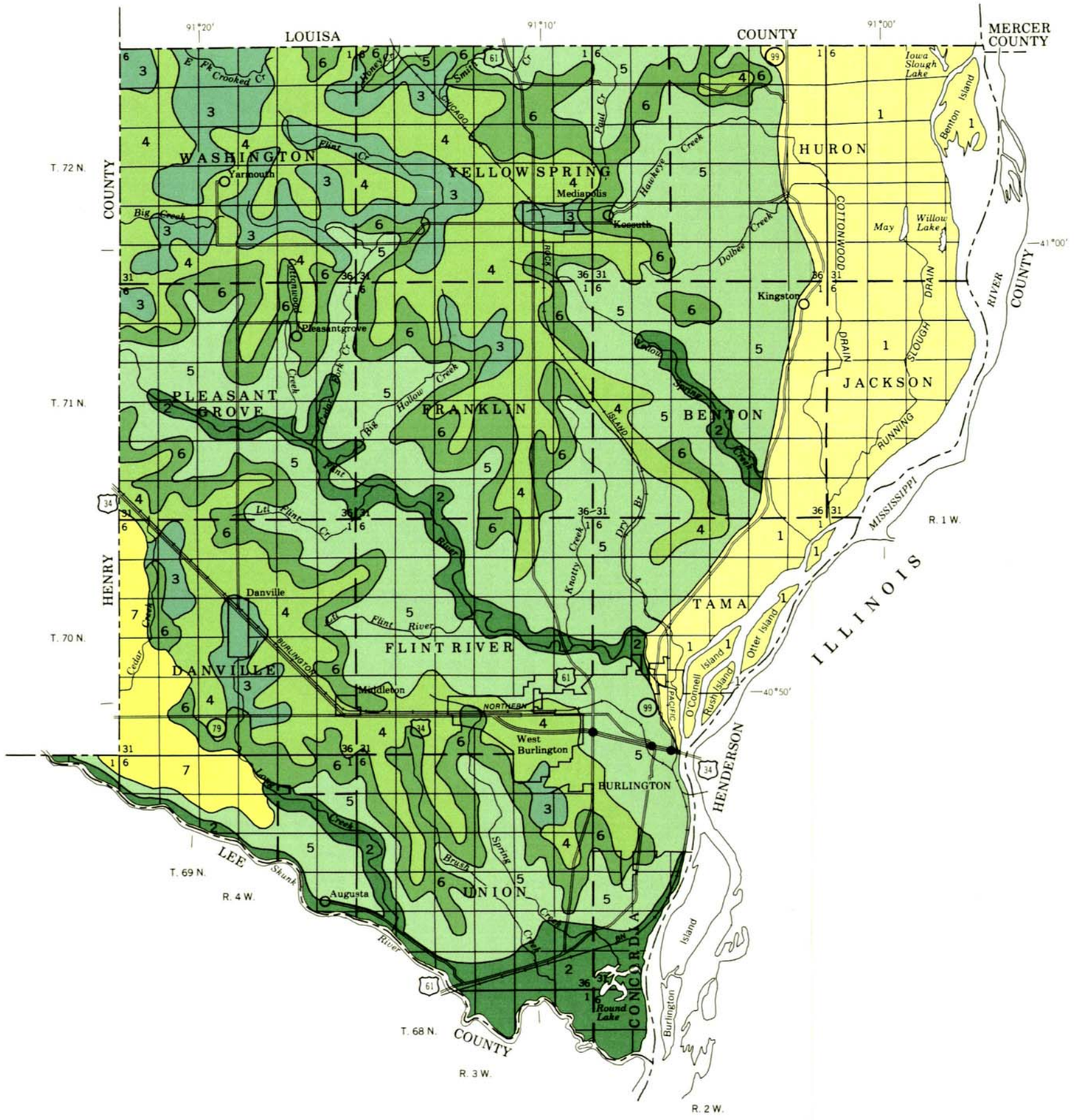
Soil name	Family or higher taxonomic class
Ackmore	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
Ambraw	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Ashgrove	Fine, montmorillonitic, mesic, sloping Aeric Ochraqualfs
Atterberry	Fine-silty, mixed, mesic Udollic Ochraqualfs
Belinda	Fine, montmorillonitic, mesic Mollic Albaqualfs
*Bertrand	Fine-silty, mixed, mesic Typic Hapludalfs
*Bolan	Coarse-loamy, mixed, mesic Typic Hapludolls
Cantril	Fine-loamy, mixed, mesic Udollic Ochraqualfs
Clarinda	Fine, montmorillonitic, mesic, sloping Typic Argiaquolls
Clinton	Fine, montmorillonitic, mesic Typic Hapludalfs
*Coland	Fine-loamy, mixed, mesic Cumulic Haplaquolls
Colo	Fine-silty, mixed, mesic Cumulic Haplaquolls
Coppock	Fine-silty, mixed, mesic Mollic Ochraqualfs
Dickinson	Coarse-loamy, mixed, mesic Typic Hapludolls
Dolbee	Fine-silty, mixed, mesic Typic Haplaquolls
Dorchester	Fine-silty, mixed (calcareous), mesic Typic Udifluvents
Douds	Fine-loamy, mixed, mesic Typic Hapludalfs
Elrin	Coarse-loamy, mixed, mesic Aquic Hapludolls
Fayette	Fine-silty, mixed, mesic Typic Hapludalfs
Fluvaquents	Mixed, mesic Fluvaquents
Gara	Fine-loamy, mixed, mesic Mollic Hapludalfs
Givin	Fine, montmorillonitic, mesic Udollic Ochraqualfs
Grundy	Fine, montmorillonitic, mesic Aquic Argiudolls
Haig	Fine, montmorillonitic, mesic Typic Argiaquolls
Hedrick	Fine-silty, mixed, mesic Mollic Hapludalfs
Hoopeston	Coarse-loamy, mixed, mesic Aquic Hapludolls
Inton	Fine-silty, mixed, mesic Typic Hapludalfs
Kalona	Fine, montmorillonitic, mesic Typic Haplaquolls
Keomah	Fine, montmorillonitic, mesic Aeric Ochraqualfs
Keswick	Fine, montmorillonitic, mesic Aquic Hapludalfs
Klum	Coarse-loamy, mixed, nonacid, mesic Mollic Udifluvents
Ladoga	Fine, montmorillonitic, mesic Mollic Hapludalfs
Lawson	Fine-silty, mixed, mesic Cumulic Hapludolls
Lindley	Fine-loamy, mixed, mesic Typic Hapludalfs
Mahaska	Fine, montmorillonitic, mesic Aquic Argiudolls
Niota Variant	Fine, mixed, mesic Mollic Albaqualfs
Nira	Fine-silty, mixed, mesic Typic Hapludolls
Nodaway	Fine-silty, mixed, nonacid, mesic Mollic Udifluvents
Nordness	Loamy, mixed, mesic Lithic Hapludalfs
*Okaw	Fine, montmorillonitic, mesic Typic Albaqualfs
Olmitz Variant	Fine-loamy, mixed, mesic Cumulic Hapludolls
Orthents	Mixed, mesic Udorthents
Otley	Fine, montmorillonitic, mesic Typic Argiudolls
Pershing	Fine, montmorillonitic, mesic Udollic Ochraqualfs
Rinda	Fine, montmorillonitic, mesic, sloping Mollic Ochraqualfs
Rubio	Fine, montmorillonitic, mesic Mollic Albaqualfs
*Shaffton	Fine-loamy, mixed, mesic Fluvaquentic Hapludolls
Snider	Fine-loamy, mixed, mesic Aquic Hapludolls
Sparta	Sandy, mixed, mesic Entic Hapludolls
Sperry	Fine, montmorillonitic, mesic Typic Argialbolls
Taintor	Fine, montmorillonitic, mesic Typic Argiaquolls
Titus	Fine, montmorillonitic, mesic Fluvaquentic Haplaquolls
Tuskeego	Fine, montmorillonitic, mesic Mollic Ochraqualfs
Vesser	Fine-silty, mixed, mesic Argiaquic Argialbolls
Wabash	Fine, montmorillonitic, mesic Vertic Haplaquolls
Weller	Fine, montmorillonitic, mesic Aquic Hapludalfs
Zook	Fine, montmorillonitic, mesic Cumulic Haplaquolls

* U.S. GOVERNMENT PRINTING OFFICE: 1983 - 389-230/2063

NRCS Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.



U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
IOWA AGRICULTURE AND HOME ECONOMICS EXPERIMENT STATION
COOPERATIVE EXTENSION SERVICE, IOWA STATE UNIVERSITY
DEPARTMENT OF SOIL CONSERVATION, STATE OF IOWA

GENERAL SOIL MAP

DES MOINES COUNTY, IOWA

Scale 1:190,080

1 0 1 2 3 4 Miles

1 0 1 2 3 4 5 6 Kilometers

N

SOIL LEGEND*

1 — Wabash-Titus-Dolbee association: Nearly level, very poorly drained and poorly drained, silty and clayey soils on bottom land

2 — Nodaway-Lawson-Klum association: Nearly level, moderately well drained and somewhat poorly drained, loamy and silty soils on bottom land

3 — Nira-Otley-Mahaska association: Nearly level to moderately sloping, moderately well drained and somewhat poorly drained, silty soils on uplands

4 — Mahaska-Taintor association: Nearly level, somewhat poorly drained and poorly drained, silty soils on uplands

5 — Clinton-Lindley association: Gently sloping to very steep, moderately well drained and well drained, loamy and silty soils on uplands and high stream benches

6 — Givin-Hedrick-Ladoga association: Nearly level to moderately sloping, somewhat poorly drained and moderately well drained, silty soils on uplands

7 — Weller-Pershing-Grundy association: Gently sloping and moderately sloping, moderately well drained and somewhat poorly drained, silty soils on uplands

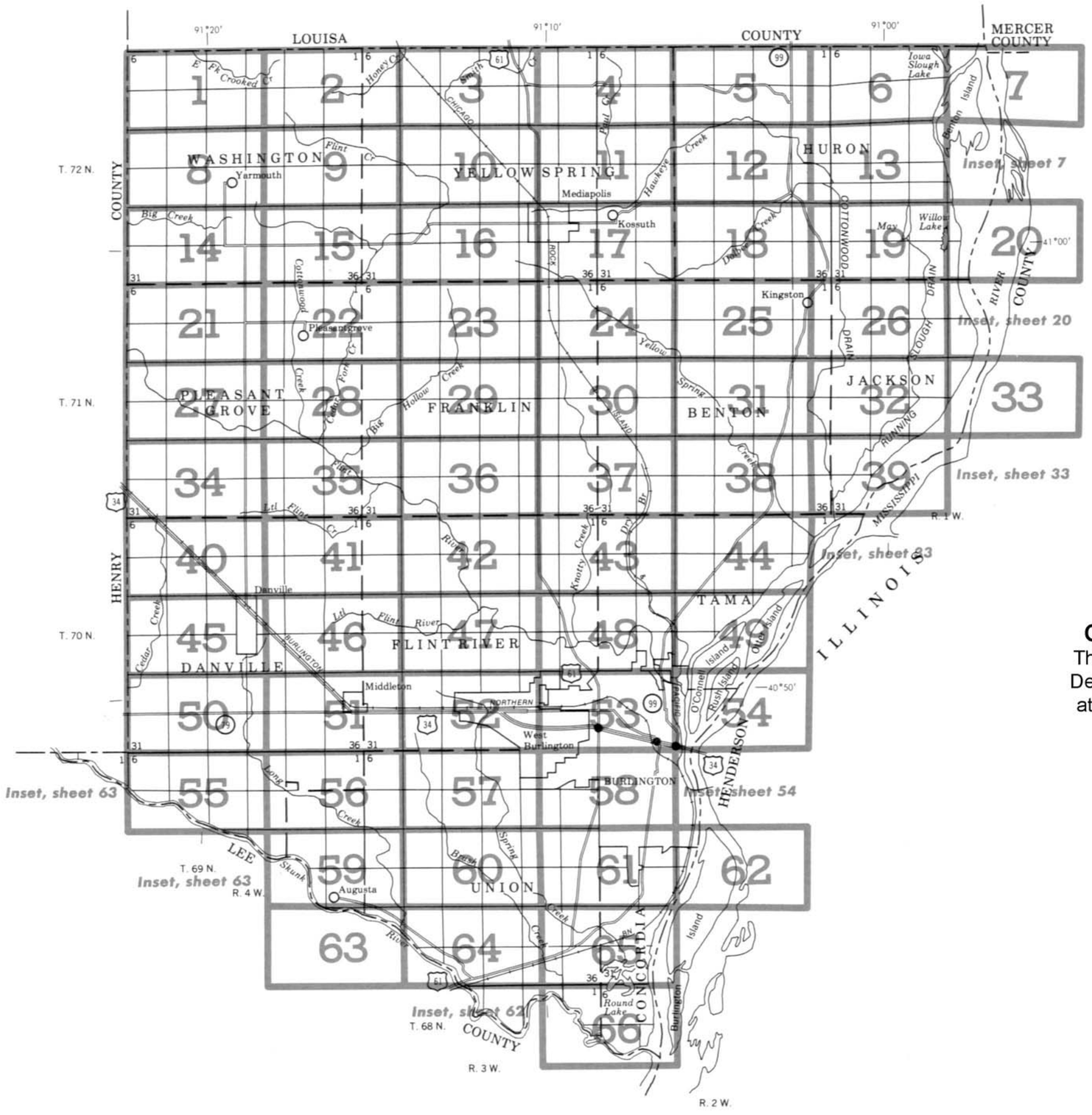
*The texture given in the descriptive headings refers to the surface layer of the major soils in each association.

Compiled 1982

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



INDEX TO MAP SHEETS
DES MOINES COUNTY, IOWA

Scale 1:190,080

1 0 1 2 3 4 Miles

1 0 1 2 3 4 5 6 Kilometers

N

Original text from each individual map sheet read:

This soil map is compiled on 1978 aerial photography by the U.S. Department of Agriculture. Soil Conservation Service and Cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and a letter. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 following the slope letter indicates that the soil is moderately eroded.

SYMBOL	NAME
41	Sparta loamy fine sand, 0 to 2 percent slopes
41B	Sparta loamy fine sand, 2 to 7 percent slopes
51	Vesser silt loam, 0 to 2 percent slopes
54	Zook silty clay loam, 0 to 2 percent slopes
56B	Cantril loam, 2 to 5 percent slopes
58E	Douds loam, 14 to 18 percent slopes
65D2	Lindley loam, 9 to 14 percent slopes, moderately eroded
65E	Lindley loam, 14 to 18 percent slopes
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded
65F	Lindley loam, 18 to 25 percent slopes
65G	Lindley loam, 25 to 40 percent slopes
74	Rubio silt loam, 0 to 2 percent slopes
75	Givin silt loam, 1 to 3 percent slopes
76B	Ladoga silt loam, 2 to 5 percent slopes
76C	Ladoga silt loam, 5 to 9 percent slopes
76C2	Ladoga silt loam, 5 to 9 percent slopes, moderately eroded
80B	Clinton silt loam, 2 to 5 percent slopes
80C	Clinton silt loam, 5 to 9 percent slopes
80C2	Clinton silt loam, 5 to 9 percent slopes, moderately eroded
80D	Clinton silt loam, 9 to 14 percent slopes
80D2	Clinton silt loam, 9 to 14 percent slopes, moderately eroded
122	Sperry silt loam, 0 to 1 percent slopes
130	Belinda silt loam, 0 to 2 percent slopes
131B	Pershing silt loam, 2 to 5 percent slopes
131C2	Pershing silt loam, 5 to 9 percent slopes, moderately eroded
132B	Weller silt loam, 2 to 5 percent slopes
132C	Weller silt loam, 5 to 9 percent slopes
132C2	Weller silt loam, 5 to 9 percent slopes, moderately eroded
133	Colo silty clay loam, 0 to 2 percent slopes
133B	Colo silty clay loam, 2 to 5 percent slopes
135	Coland clay loam, 0 to 2 percent slopes
158	Dorchester silt loam, 0 to 2 percent slopes
163B	Fayette silt loam, 2 to 5 percent slopes
163C	Fayette silt loam, 5 to 9 percent slopes
163C2	Fayette silt loam, 5 to 9 percent slopes, moderately eroded
163D	Fayette silt loam, 9 to 14 percent slopes
172	Wabash silty clay, 0 to 2 percent slopes
173	Hoopeston sandy loam, 0 to 2 percent slopes
174	Bolan loam, 0 to 2 percent slopes
174B	Bolan loam, 2 to 5 percent slopes
175	Dickinson fine sandy loam, 0 to 2 percent slopes
175B	Dickinson fine sandy loam, 2 to 5 percent slopes
179D2	Gara loam, 9 to 14 percent slopes, moderately eroded
179E	Gara loam, 14 to 18 percent slopes
179E2	Gara loam, 14 to 18 percent slopes, moderately eroded
180	Keomah silt loam, 1 to 3 percent slopes
208	Klum fine sandy loam, 0 to 2 percent slopes
220	Nodaway silt loam, 0 to 2 percent slopes
222C	Clarinda silty clay loam, 5 to 9 percent slopes
223C2	Rinda silt loam, 5 to 9 percent slopes, moderately eroded
223D2	Rinda silt loam, 9 to 14 percent slopes, moderately eroded
263	Okaw silt loam, 0 to 2 percent slopes
263B	Okaw silt loam, 2 to 5 percent slopes
279	Taintor silty clay loam, 0 to 1 percent slopes
280	Mahaska silty clay loam, 1 to 3 percent slopes
281B	Otley silty clay loam, 2 to 5 percent slopes
281C2	Otley silty clay loam, 5 to 9 percent slopes, moderately eroded
291	Atterberry silt loam, 1 to 3 percent slopes
362	Haig silt loam, 0 to 2 percent slopes
364B	Grundy silty clay loam, 1 to 4 percent slopes
424D	Lindley-Keswick loams, 9 to 14 percent slopes
424D2	Lindley-Keswick loams, 9 to 14 percent slopes, moderately eroded
425D	Keswick loam, 9 to 14 percent slopes
425D2	Keswick loam, 9 to 14 percent slopes, moderately eroded
430	Ackmore silt loam, 0 to 2 percent slopes
453	Tuskeego silt loam, 1 to 3 percent slopes
478G	Nordness-Rock outcrop complex, 25 to 40 percent slopes
484	Lawson silt loam, 0 to 2 percent slopes
499F	Nordness silt loam, 14 to 25 percent slopes
520	Coppock silt loam, 0 to 2 percent slopes
570B	Nira silty clay loam, 2 to 5 percent slopes
570C2	Nira silty clay loam, 5 to 9 percent slopes, moderately eroded
571B	Hedrick silt loam, 2 to 5 percent slopes
571C2	Hedrick silt loam, 5 to 9 percent slopes, moderately eroded
572B	Inton silt loam, 2 to 5 percent slopes
572C2	Inton silt loam, 5 to 9 percent slopes, moderately eroded
730B	Nodaway-Cantril-Klum complex, 2 to 5 percent slopes
779	Kalona silty clay loam, 0 to 1 percent slopes
793	Bertrand silt loam, 0 to 2 percent slopes
793B	Bertrand silt loam, 2 to 5 percent slopes
795D2	Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded
834	Titus silty clay loam, 0 to 2 percent slopes
880B	Clinton silt loam, benches, 2 to 5 percent slopes
893D2	Gara-Rinda complex, 9 to 14 percent slopes, moderately eroded
950	Niota Variant silty clay loam, 0 to 3 percent slopes
950D	Niota Variant silty clay loam, 7 to 14 percent slopes
960	Shaffton loam, 0 to 2 percent slopes
961	Ambraw loam, 0 to 2 percent slopes
1273B	Olmitz Variant loam, 2 to 5 percent slopes
1273C	Olmitz Variant loam, 5 to 10 percent slopes
1316	Fluvaquents, frequently flooded, 0 to 3 percent slopes
1587	Dolbee silt loam, 0 to 2 percent slopes
1826	Snider loam, 0 to 2 percent slopes
2208	Klum fine sandy loam, calcareous, 0 to 2 percent slopes
2226	Elrin loam, 0 to 2 percent slopes
2484	Lawson silt loam, frequently flooded, 0 to 2 percent slopes
4000	Urban land
5010	Pits, sand and gravel
5030	Pits, limestone quarry
5040	Orthents, loamy
5080	Orthents, nearly level

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

National, state or province

County

Reservation (national forest or park, state forest or park, and large airport)

Field sheet matchline & neatline

AD HOC BOUNDARY (label)

Small airport, airfield, park, cemetery — Davis Airstrip

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

Divided (median shown if scale permits)

Other roads

ROAD EMBLEMS & DESIGNATIONS

Federal — 618

State — 92

RAILROAD

LEVEES

Without road

With road

With railroad

DAMS

Large (to scale)

Medium or small — WATER / RF

PITS

Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

Farmstead, house (omit in urban areas)

Church

School

WATER FEATURES

DRAINAGE

Perennial, double line

Perennial, single line

Intermittent

Crossable with tillage implements

Not crossable with tillage implements

Drainage end

Canals or ditches

Double-line (label) — CANAL

Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

Perennial — WATER / W

Intermittent — INT / I

MISCELLANEOUS WATER FEATURES

Marsh

Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 130 / 131B

ESCARPMENTS

Bedrock (points down slope)

Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) — S

MISCELLANEOUS (each symbol represents 2 acres or less)

Clay spot

Dumps and other similar non soil areas

Rock outcrop (includes sandstone and shale)

Sandy spot

Severely eroded spot

Red clay spot

Light colored deposition

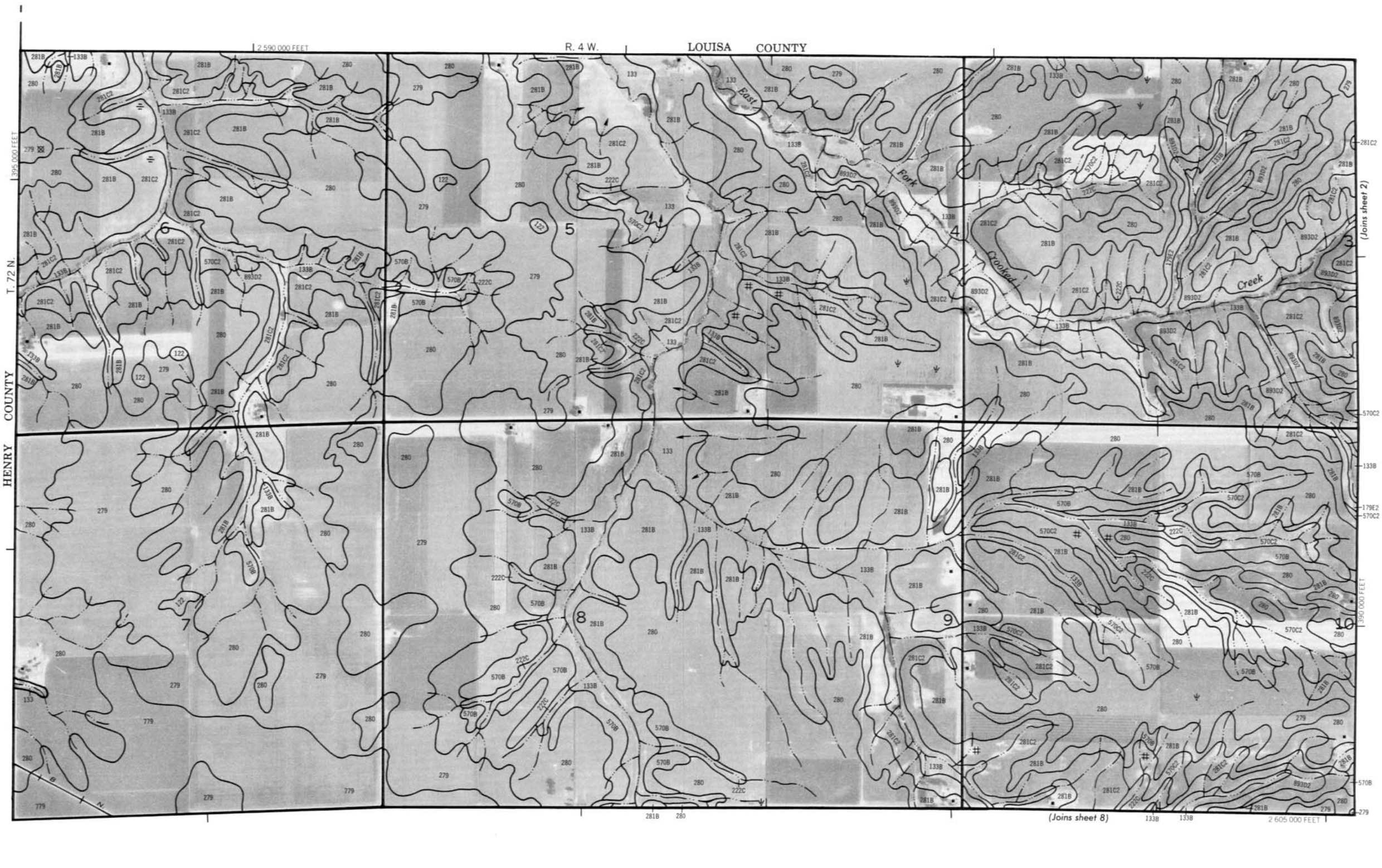
Sperry soils

Glacial till outcrop

Borrow area

Sewage lagoon — S.L.

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 1



SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 2

(2)

N

1 MILE

1 KILOMETER

(Joins sheet 1)

LOUISA COUNTY

R. 4 W.

R. 3 W.

2 620 000 FEET

T. 72 N.

395 000 FEET

Scale 1:15 840

0 0.5 1

1/4 1/2 3/4

390 000 FEET

(Joins sheet 9)

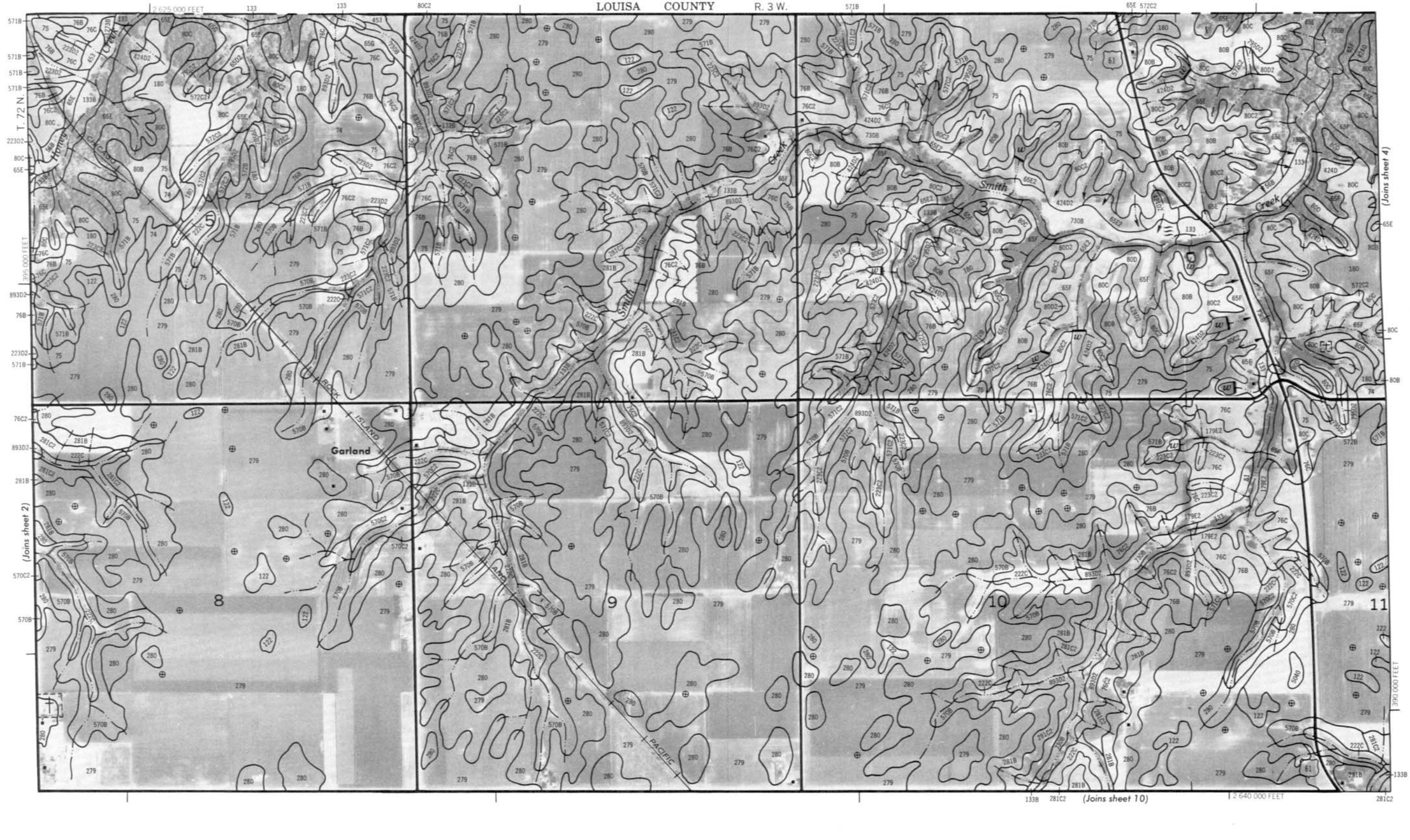
2 610 000 FEET

(Joins sheet 3)

Honey Creek

Honey Creek

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 3



SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 4

4

N

1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 0.5 1/2 3/4 1

LOUISA COUNTY

R. 3 W. | R. 2 W.

T. 72 N.

2 660 000 FEET

400 000 FEET

390 000 FEET

2 645 000 FEET

Paul Creek

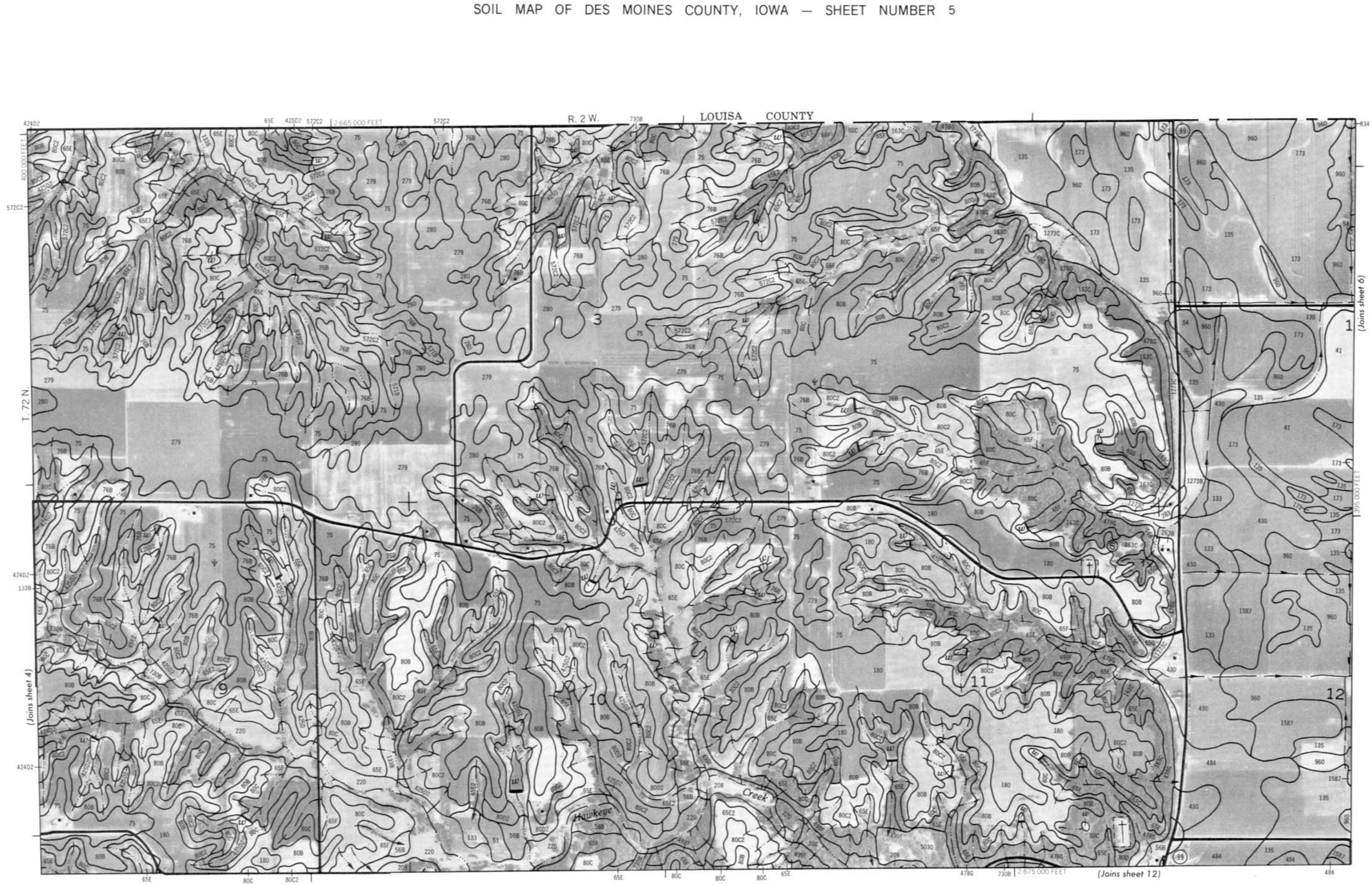
Northfield

(Joins sheet 3)

(Joins sheet 5)

(Joins sheet 11)

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 5



5

N

1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 0 0.5

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 6

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 7

7

N

R. 1 W.

270 000 FEET

LOUISA COUNTY

400 000 FEET

T. 72 N.

Iowa Slough Lake

Garner Island

HURON ISLAND

MISSISSIPPI RIVER

HENDERSON COUNTY ILLINOIS

395 000 FEET

(Joins sheet 6)

(Joins upper right)

2 705 000 FEET

R. 1 W.

(Joins lower left)

390 000 FEET

T. 72 N.

HURON ISLAND

MISSISSIPPI RIVER

HENDERSON COUNTY ILLINOIS

385 000 FEET

(Joins sheet 13)

water

(Joins sheet 20)

2 705 000 FEET

1 MILE

1 KILOMETER

Scale 1:15 840

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 8

(8)

N

1 MILE

1 KILOMETER

HENRY COUNTY

Scale 1:15 840

0 1/4 0.5 1/2 1 3/4

380 000 FEET

2 590 000 FEET

2 605 000 FEET

385 000 FEET

T. 72 N.

R. 4 W.

(Joins sheet 1)

(Joins sheet 14)

(Joins sheet 9)

BURLINGTON NORTHERN

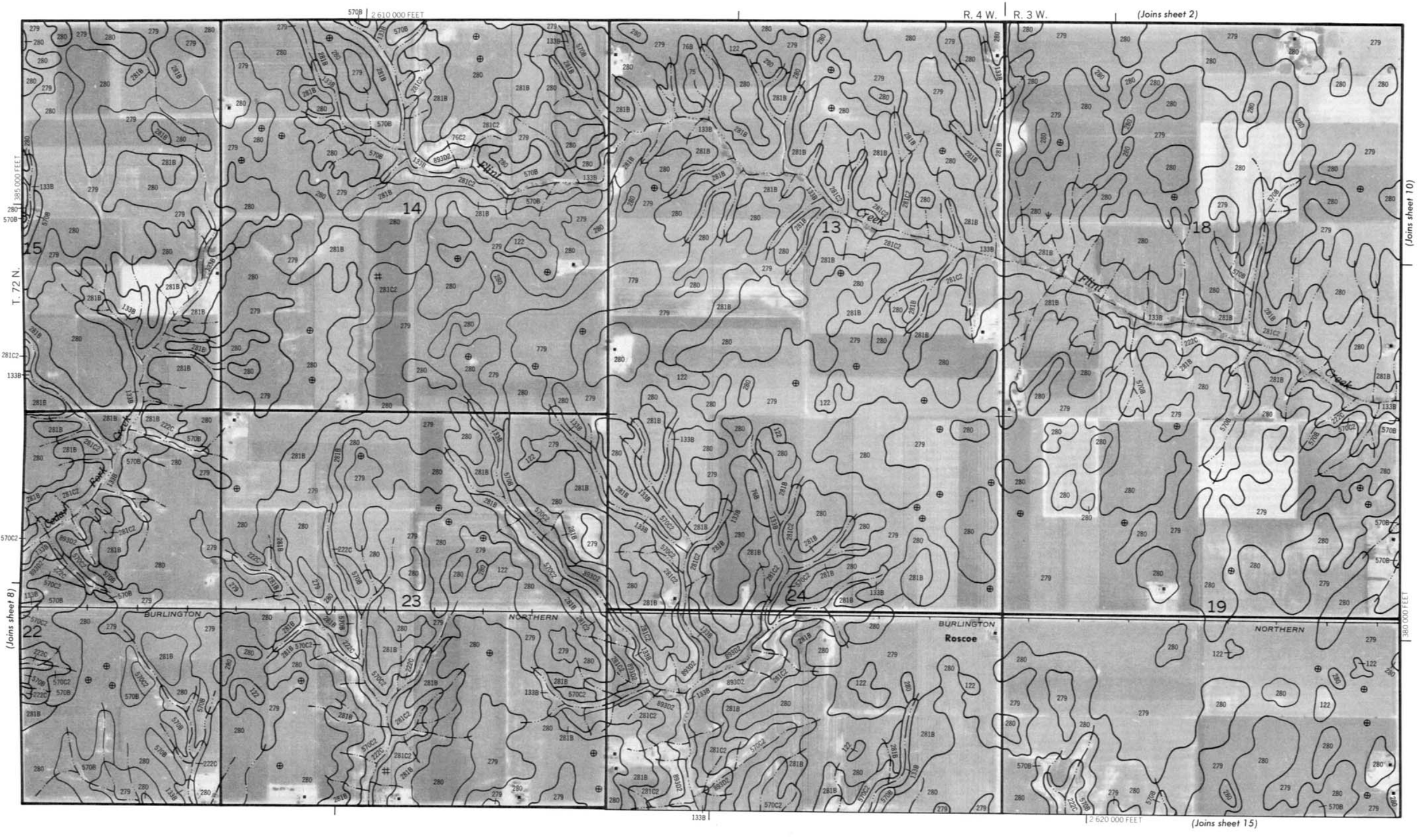
Yarmouth

Crooked Creek

18 17 16 15

19 20 21 22

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 9



SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 10

10

N

1 MILE

1 KILOMETER

Scale 1:15 840

0 0 1/4 0.5 1/2 1 3/4

(Joins sheet 3)

R. 3 W.

2 640 000 FEET

T. 72 N.

385 000 FEET

380 000 FEET

2 625 000 FEET

(Joins sheet 9)

(Joins sheet 16)

(Joins sheet 11)

17 16 15 14 21 22 23 20

CHICAGO ROCK ISLAND AND PACIFIC

Flint Creek

BURLINGTON NORTHERN

BURLINGTON NORTHERN

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 11

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 12

12

N

1 MILE

1 KILOMETER

(Joins sheet 11)

Scale 1:15 840

0 0.5 1/4 1/2 3/4 1

(Joins sheet 5)

R. 2 W.

T. 72 N.

2 675 000 FEET

385 000 FEET

380 000 FEET

2 665 000 FEET

(Joins sheet 13)

(Joins sheet 18)

Hawkeye Creek

Dolbee Creek

16 15 14 13 21 22 23 24

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 13

13

N

MILE

KILOMETER

Scale 1:15 840

2 680 000 FEET

R. 2 W.

R. 1 W.

T. 72 N.

385 000 FEET

(Joins sheet 12)

(Joins sheet 6)

(Joins inset, sheet 7)

(Joins sheet 19)

2 695 000 FEET

Huron

HURON ISLAND

MISSISSIPPI RIVER

HAWKEYE CREEK

HAWKEYE-DOLBEE DIVERSION CHANNEL

DOLBEE CREEK

13 18 17 16 19 20 21 24

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 14

14

N

(Joins sheet 8)

R. 4 W.

2 605 000 FEET

375 000 FEET

T. 72 N.

(Joins sheet 15)

HENRY COUNTY

Big Creek

Cedar Fork Cr.

30

29

28

31

32

33

34

2 590 000 FEET

(Joins sheet 21)

Scale 1:15 840

1 MILE

1 KILOMETER

0

1/4

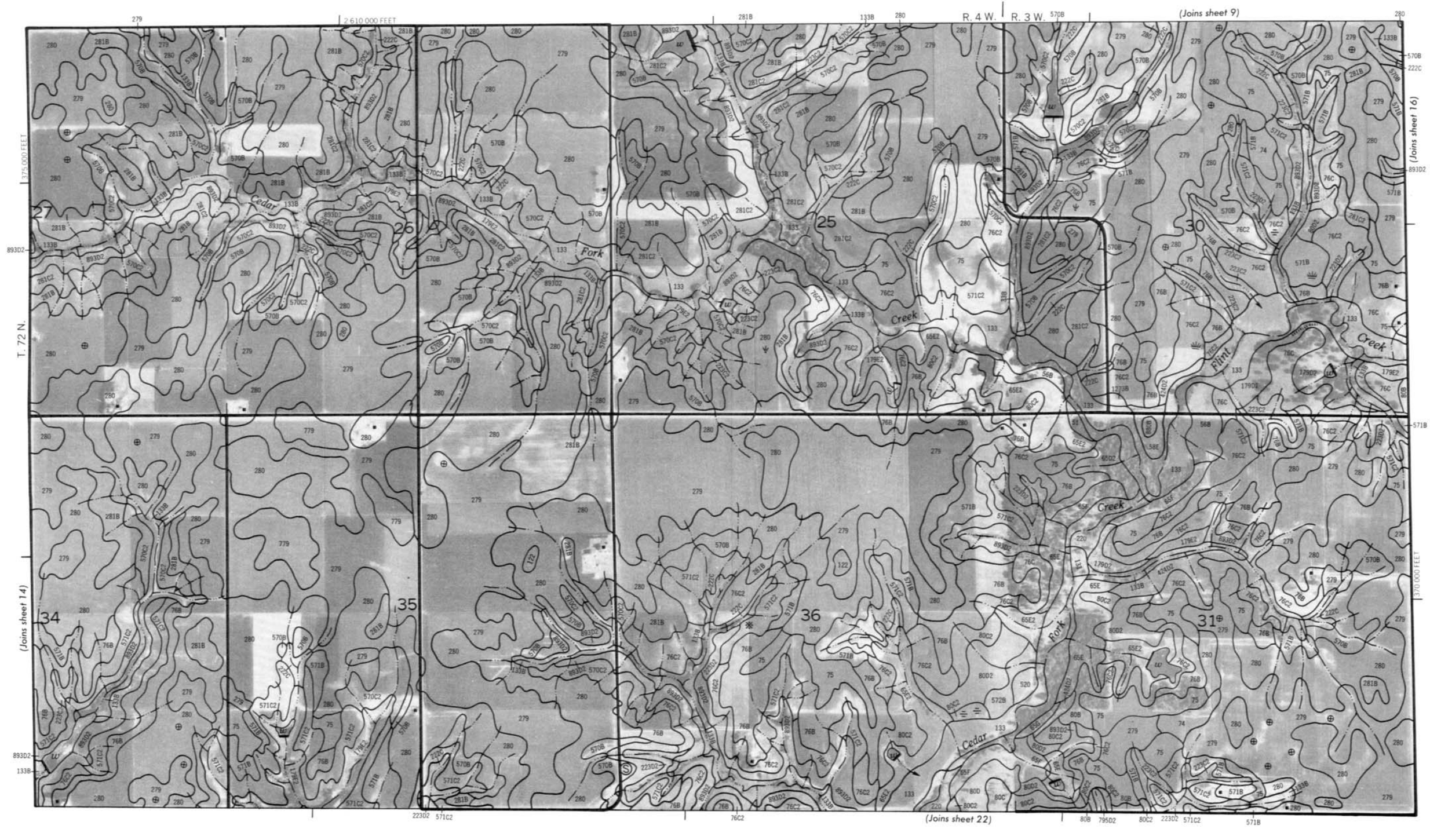
0.5

1/2

3/4

1

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 15



15

N

MILE

KILOMETER

0 1/4 1/2 3/4 1

0 0.5 1

Scale 1:15 840

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 16

16

N

(Joins sheet 10)

R. 3 W.

2 640 000 FEET

BURLINGTON NORTHERN

T. 72 N.

375 000 FEET

(Joins sheet 15)

(Joins sheet 17)

Scale 1:15 840

1 MILE

1 KILOMETER

0 0.5 1

1/4 1/2 3/4

370 000 FEET

2 625 000 FEET

(Joins sheet 23)

Creek

29 28 27 26 32 33 34 35

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 17

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 18

18

N

1 MILE

1 KILOMETER

Scale 1:15 840

0 0.5 0

1/4 1/2 3/4 1

(Joins sheet 12)

R. 2 W.

2 680 000 FEET

T. 72 N.

375 000 FEET

(Joins sheet 17)

(Joins sheet 19)

370 000 FEET

2 665 000 FEET

(Joins sheet 25)

Creek

Dallas

23

26

25

33

34

35

36

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 19

19

N

1 MILE

1 KILOMETER

0 1/4 1/2 3/4 1

0 0.5 1

Scale 1:15 840

20

N

1 MILE

1 KILOMETER

Scale 1:15 840

0 0.5 1

1/4 1/2 3/4

(Joins inset, sheet 7)

R. 1 W.

1316

2 705 000 FEET

380 000 FEET

T. 72 N.

(Joins sheet 19)

27

MISSISSIPPI

RIVER

HENDERSON COUNTY

ILLINOIS

34

370 000 FEET

1316

2 700 000 FEET

(Joins upper right)

(Joins lower left)

R. 1 W.

2 704 000 FEET

(Joins sheet 26)

3

10

T. 71 N.

365 000 FEET

360 000 FEET

2 700 000 FEET

1587

(Joins sheet 33)

4000 AND 5000-FOOT GRID TICKS

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 21

21

N

2 590 000 FEET

R. 4 W.

(Joins sheet 14)

(Joins sheet 22)

365 000 FEET

T. 71 N.

COUNTY

HENRY

(Joins sheet 27)

2 605 000 FEET

860 000 FEET

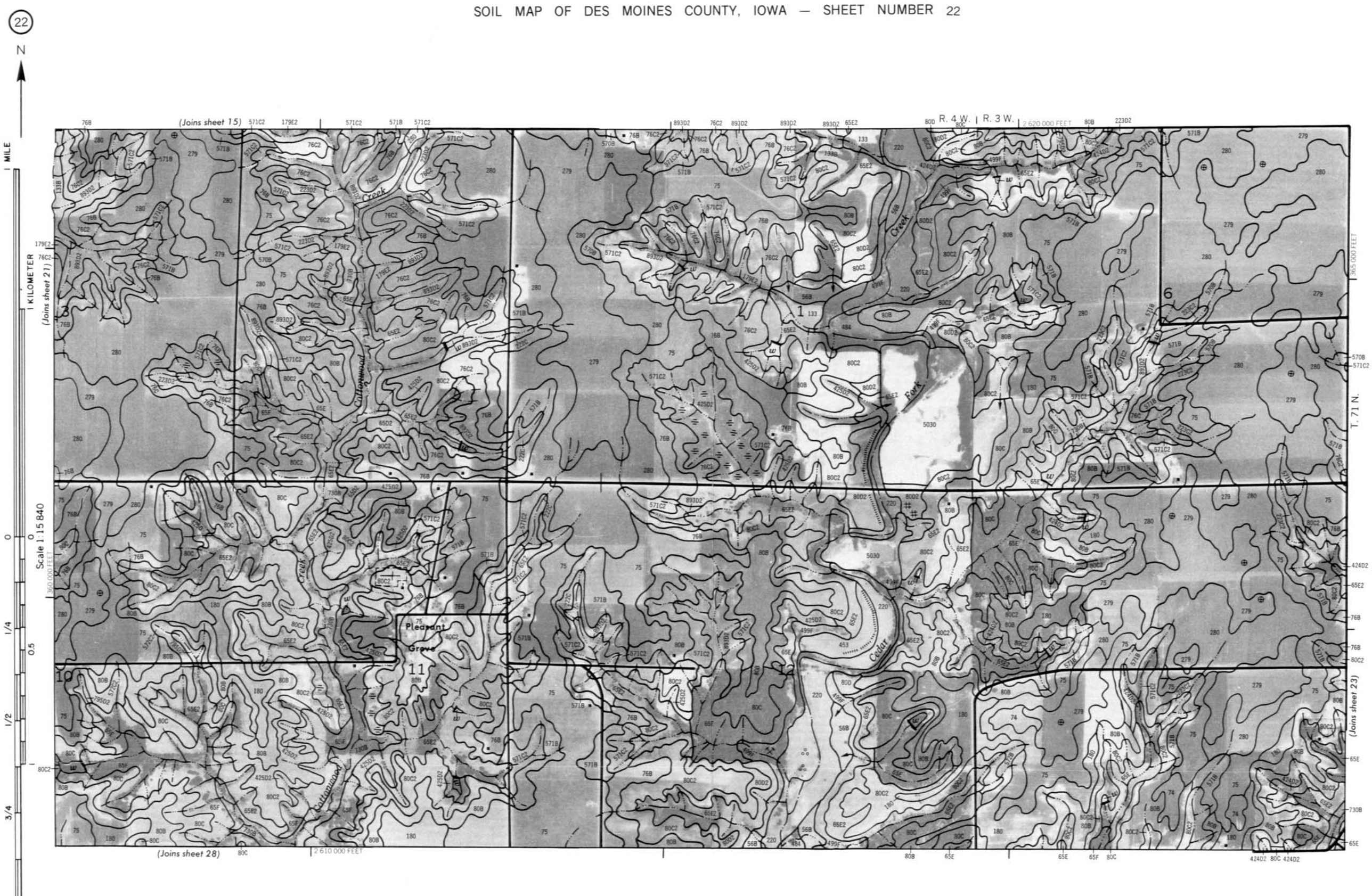
1 MILE

1 KILOMETER

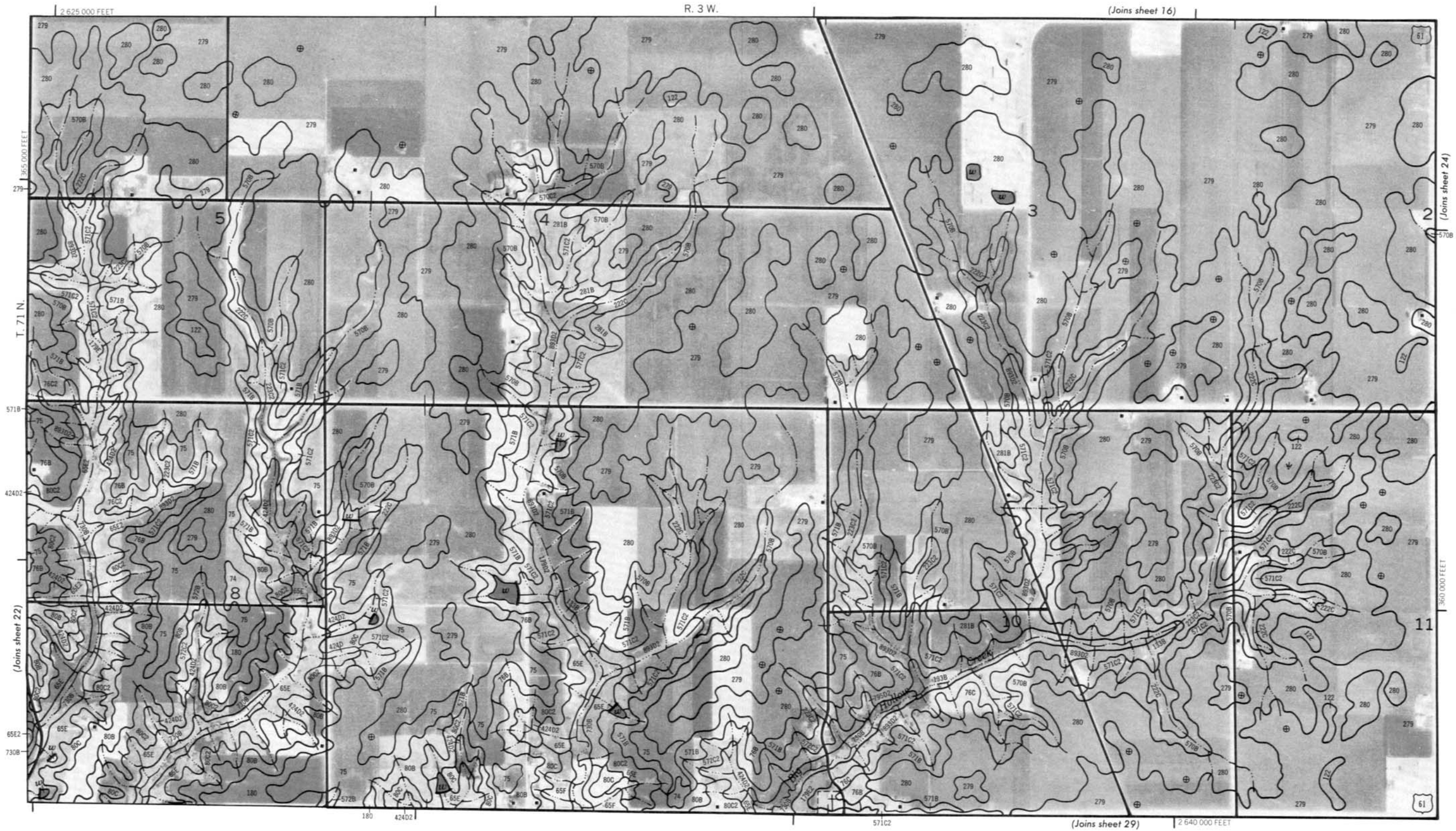
Scale 1:15 840

0 1/4 1/2 3/4 1
0 0.5 1

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 22



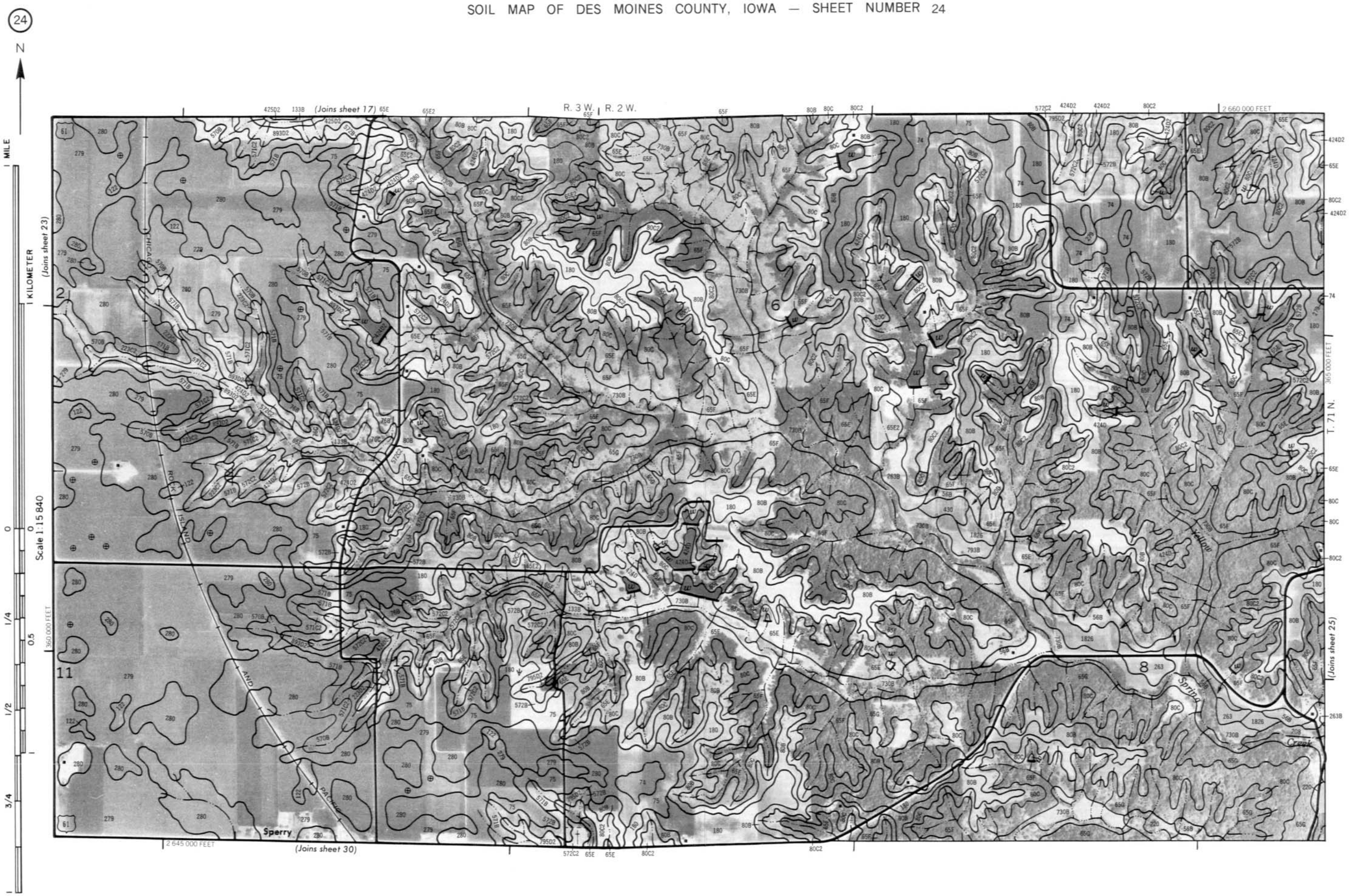
SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 23



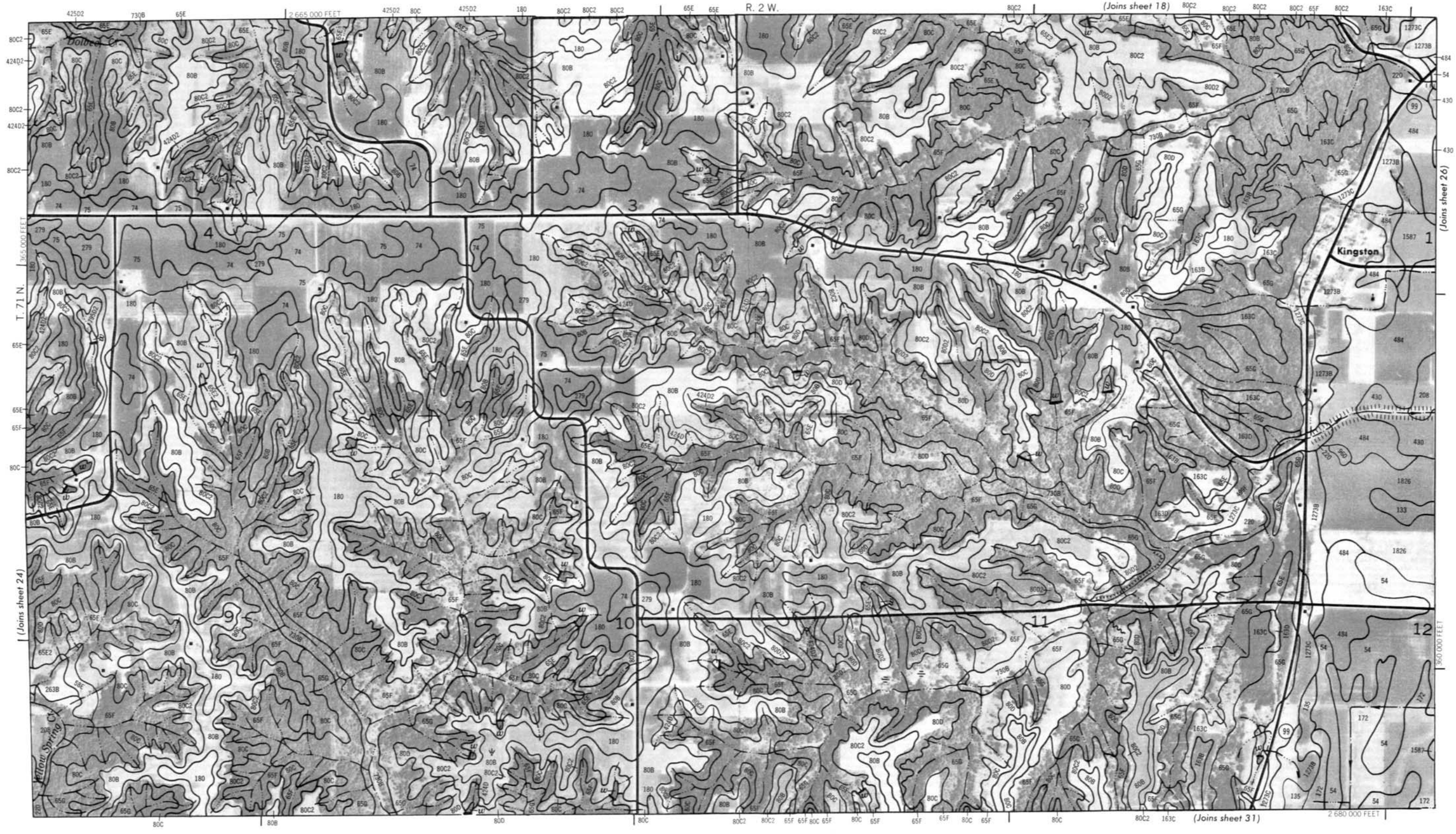
23

N

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 24



SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 25



SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 26

(26)

N

R. 2 W. | R. 1 W.

(Joins sheet 19)

(Joins sheet 25)

2 695 000 FEET

T. 71 N.

365 000 FEET

360 000 FEET

(Joins sheet 32)

2 685 000 FEET

(Joins inset, sheet 20)

1 MILE

1 KILOMETER

Scale 1:15 840

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 27

27

N

2 590 000 FEET

R. 4 W.

(Joins sheet 21)

T. 71 N.

HENRY COUNTY

Flint Creek

Flint Creek

(Joins sheet 28)

(Joins sheet 34)

2 605 000 FEET

350 000 FEET

355 000 FEET

1 MILE

1 KILOMETER

Scale 1:15 840

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 28

(28)

N

R. 4 W. | R. 3 W.

T. 71 N.

(Joins sheet 22)

(Joins sheet 27)

(Joins sheet 29)

(Joins sheet 35)

2 620 000 FEET

395 000 FEET

390 000 FEET

2 610 000 FEET

Scale 1:15 840

1 MILE

1 KILOMETER

0 1/4 1/2 3/4 1

0 0.5 1

Cottonwood Creek

Flint Creek

Cedar Fork Creek

Cedar Fork Creek

Big Hollow Creek

Big Hollow Recreation Area

water

15 14 13 18

22 23 24 19

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 29

29

N

2,625,000 FEET

365,000 FEET

T. 71 N.

R. 3 W.

(Joins sheet 23)

(Joins sheet 30)

(Joins sheet 28)

(Joins sheet 36)

2 640 000 FEET

350 000 FEET

BIG HOLLOW CREEK

RECREATION AREA

Big Hollow Creek

Dodgeville

15

16

14

20

21

22

23

1 MILE

1 KILOMETER

Scale 1:15 840

0 0 1/4 0.5 1/2 1 3/4

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 30

30

N

1 MILE

1 KILOMETER

Scale 1:15 840

0 0.5 0

1/4 1/2 3/4 1

(Joins sheet 29)

(Joins sheet 24)

(Joins sheet 31)

(Joins sheet 37)

R. 3 W. R. 2 W.

T. 71 N.

2 660 000 FEET

355 000 FEET

350 000 FEET

2 645 000 FEET

Sperry

CHICAGO, ROCK ISLAND AND PACIFIC

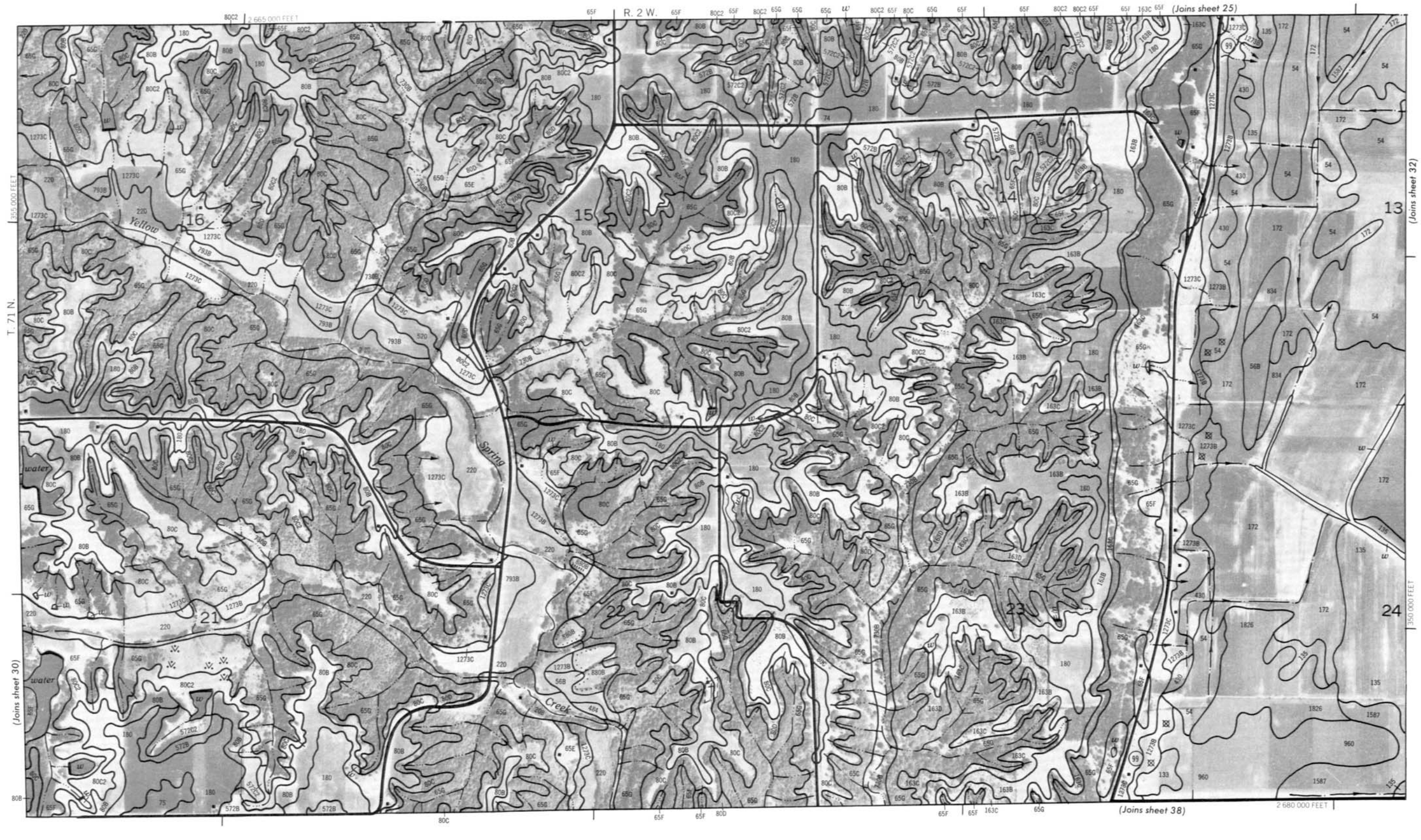
Yellow Spring Creek

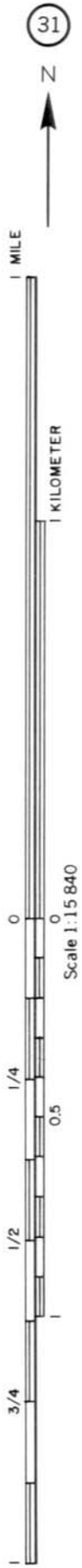
Mudlick Creek

Mudlick Creek

14 13 18 17 23 24 19 20

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 31





SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 32

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 33

33

N

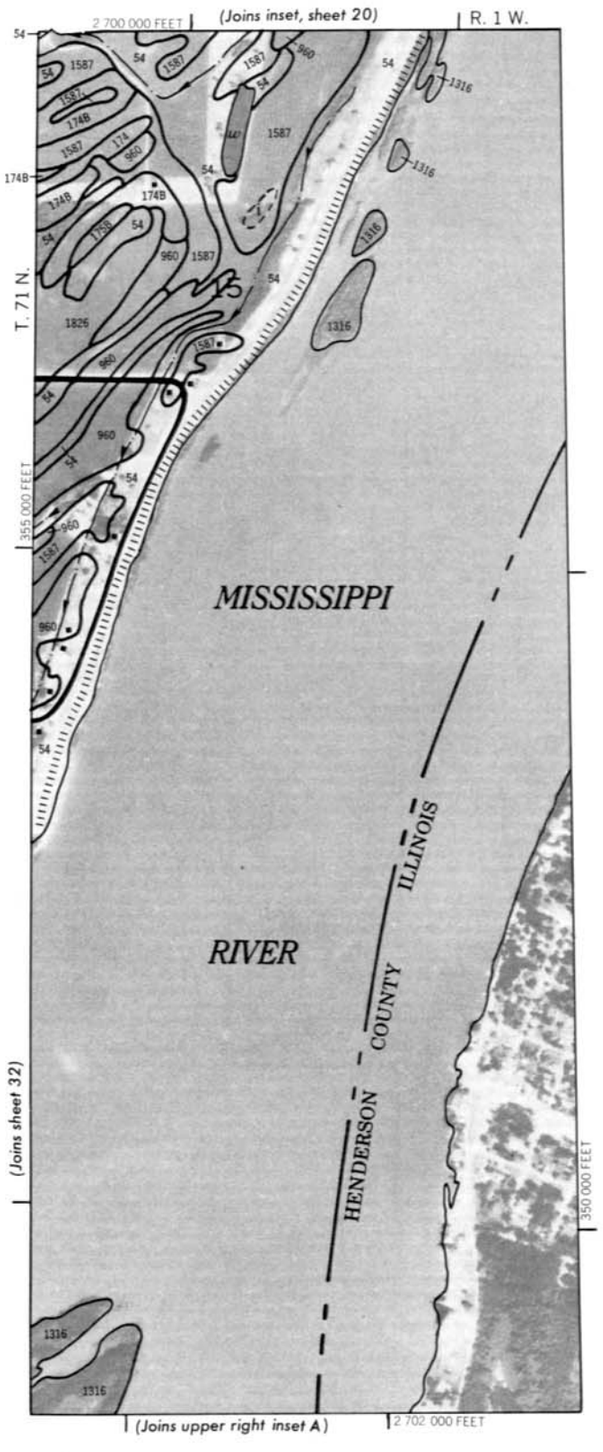
1 MILE

1 KILOMETER

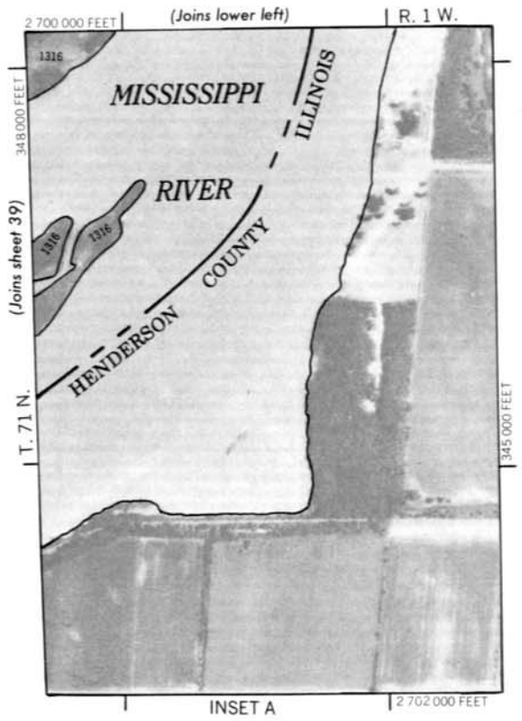
Scale 1:15 840

0 1/4 1/2 3/4 1

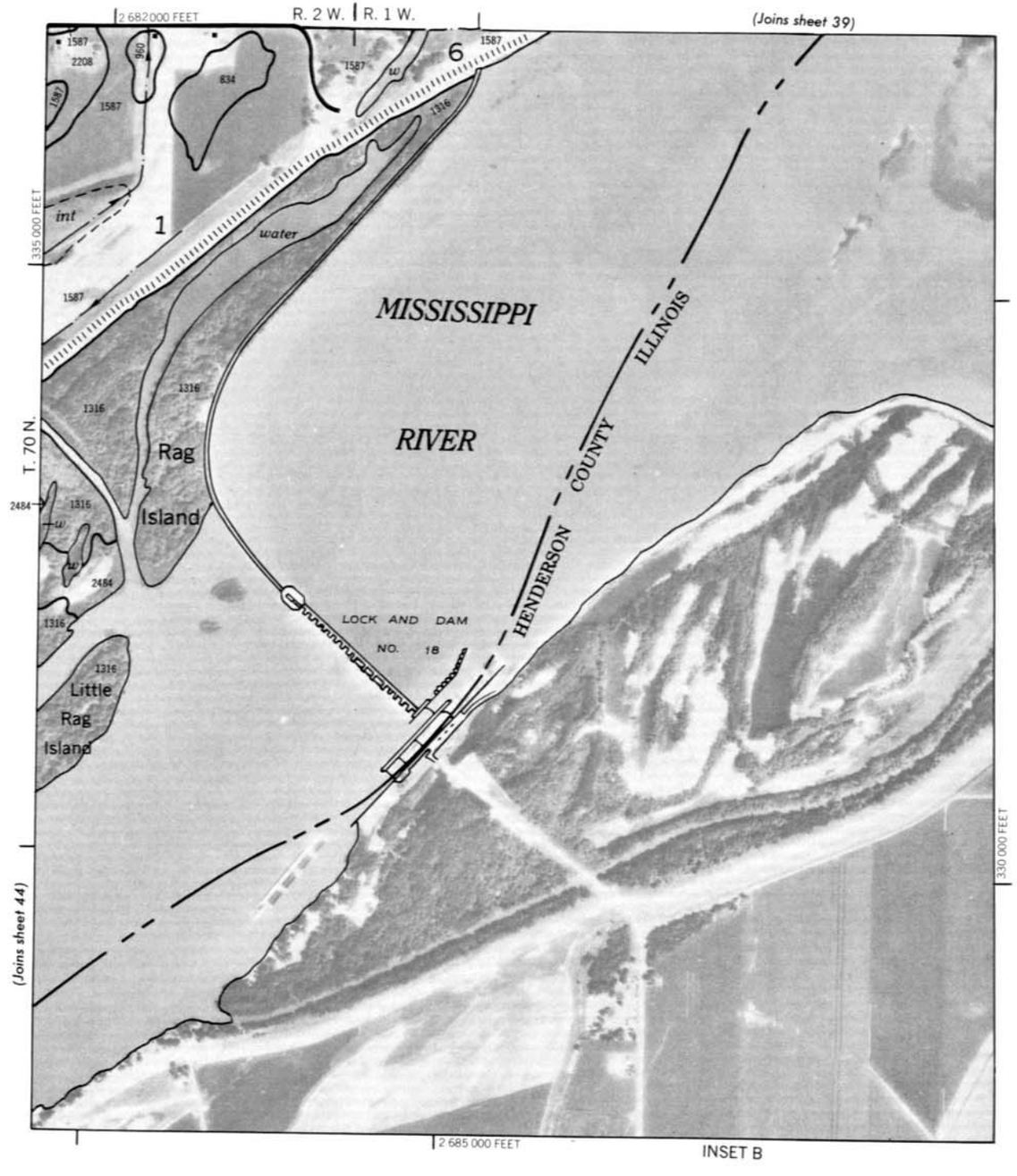
0 0.5 1



2000 AND 5000-FOOT GRID TICKS



2000 AND 3000-FOOT GRID TICKS



3000 AND 5000-FOOT GRID TICKS

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 34

(34)

N

1 MILE

1 KILOMETER

Scale 1:15 840

0 0.5 0 1/4 1/2 3/4 1

HENRY COUNTY

(Joins sheet 27)

R. 4 W.

2 605 000 FEET

345 000 FEET

T. 71 N.

(Joins sheet 35)

2 590 000 FEET

335 000 FEET

(Joins sheet 40)

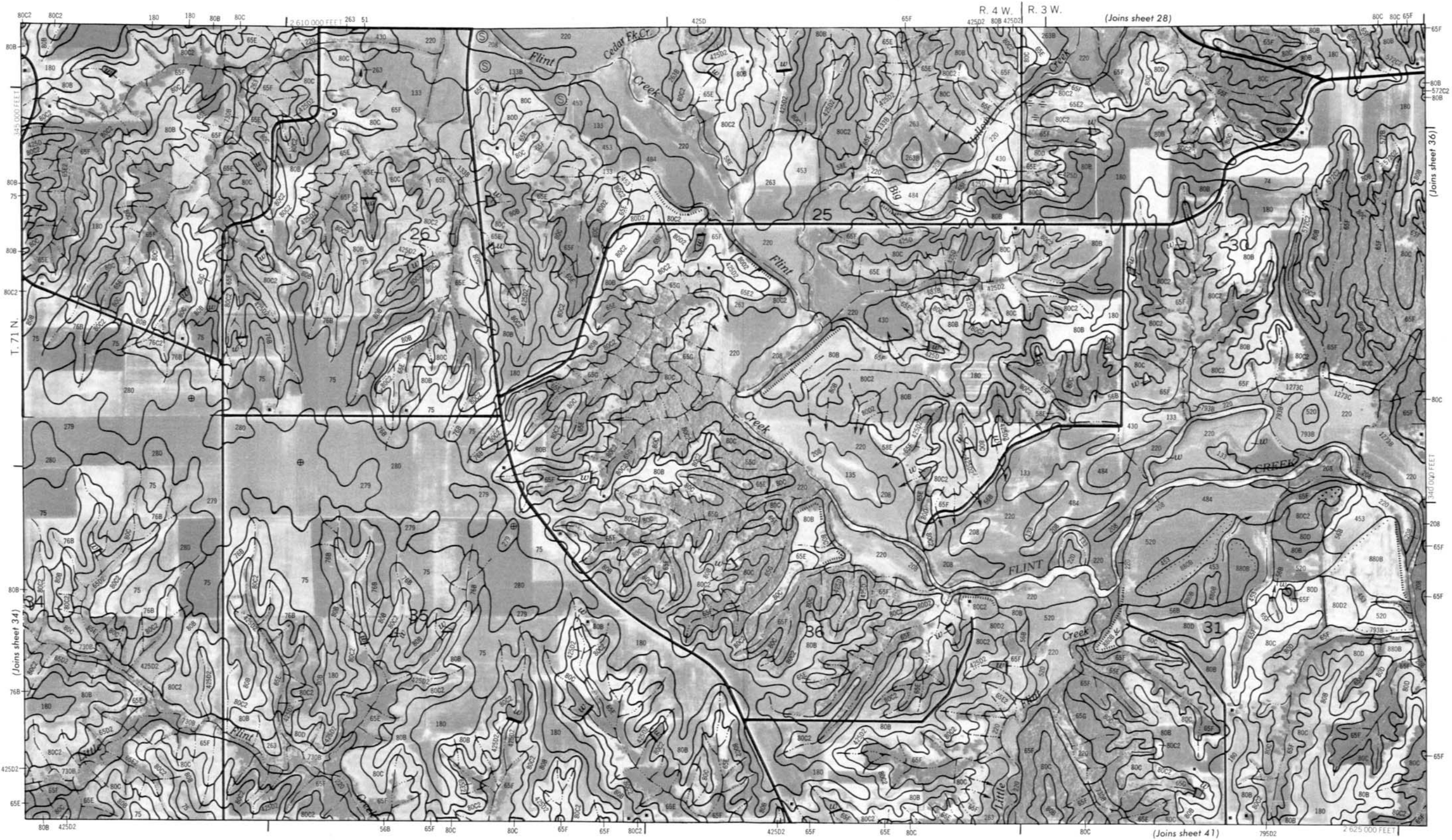
BURLINGTON

NORTHERN

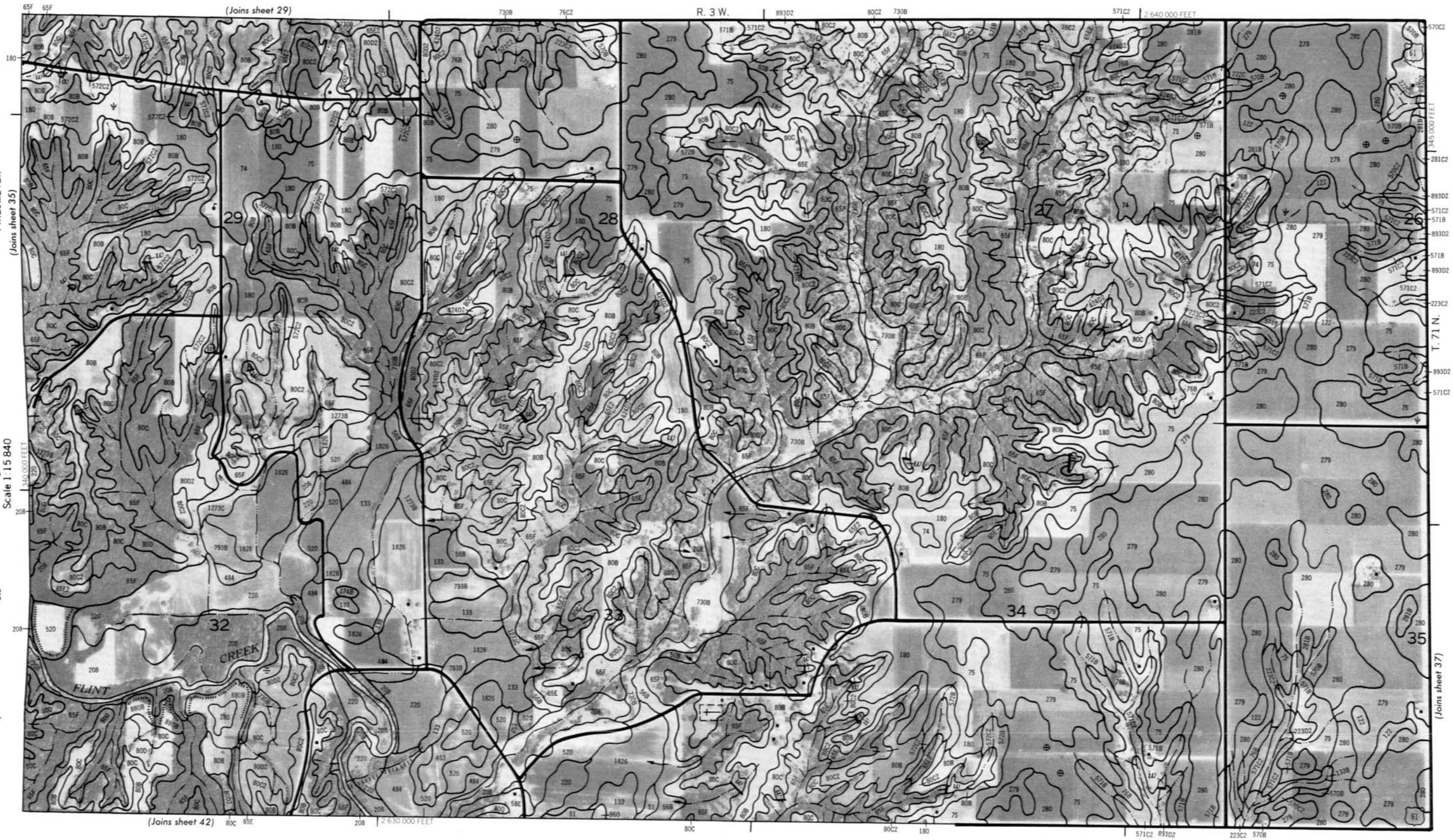
Little Flint Creek

30 31 32 33 34 27 28

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 35



SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 36



SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 37

37

N

R. 3 W. | R. 2 W.

T. 71 N.

2 645 000 FEET

345 000 FEET

340 000 FEET

2 660 000 FEET

(Joins sheet 30)

(Joins sheet 36)

(Joins sheet 38)

(Joins sheet 43)

Knotty Creek

Knotty Creek

Latty

CHICAGO, ROCK ISLAND AND PACIFIC RAILROAD

25 26 29 35 36 31 32

water

1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1
0 0.5

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 38

38

N

R. 2 W.

(Joins sheet 31)

(Joins sheet 37)

(Joins sheet 44)

(Joins sheet 39)

2 680 000 FEET

2 665 000 FEET

345 000 FEET

340 000 FEET

T. 71 N.

Scale 1:15 840

1 MILE

1 KILOMETER

0 0.5 0

1/4 1/2 3/4

Yellow River

Spring Creek

YELLOW RIVER

SPRING CREEK

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 39

39

R. 2 W. | R. 1 W.

2 685 000 FEET

(Joins sheet 32)

345 000 FEET

T. 71 N.

25

30

29

31

36

water

MISSISSIPPI RIVER

HENDERSON COUNTY ILLINOIS

(Joins inset A, sheet 33)

340 000 FEET

(Joins sheet 38)

(Joins inset B, sheet 33)

2 695 000 FEET

2208

3000 AND 5000-FOOT GRID TICKS

N

MILE

KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

0 0.5 1

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 40

(40)

N

(Joins sheet 34)

R. 4 W.

2 605 000 FEET

T. 70 N.

HENRY COUNTY

BURLINGTON NORTHERN

BURLINGTON

NORTHERN

Scale 1:15 840

1 MILE

1 KILOMETER

0 0.5 0

1/4 1/2 3/4

325 000 FEET

335 000 FEET

2 590 000 FEET

(Joins sheet 45)

(Joins sheet 41)

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 41

41

N

R. 4 W. | R. 3 W.

T. 70 N.

2 610 000 FEET

435 000 FEET

330 000 FEET

2 625 000 FEET

(Joins sheet 35)

(Joins sheet 42)

(Joins sheet 40)

(Joins sheet 46)

Little Flint Creek

Prairie Grove

1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 42

(42)

N

R. 3 W.

(Joins sheet 36)

(Joins sheet 41)

(Joins sheet 47)

(Joins sheet 43)

T. 70 N.

2 640 000 FEET

2 630 000 FEET

335 000 FEET

330 000 FEET

Scale 1:15 840

1 MILE

1 KILOMETER

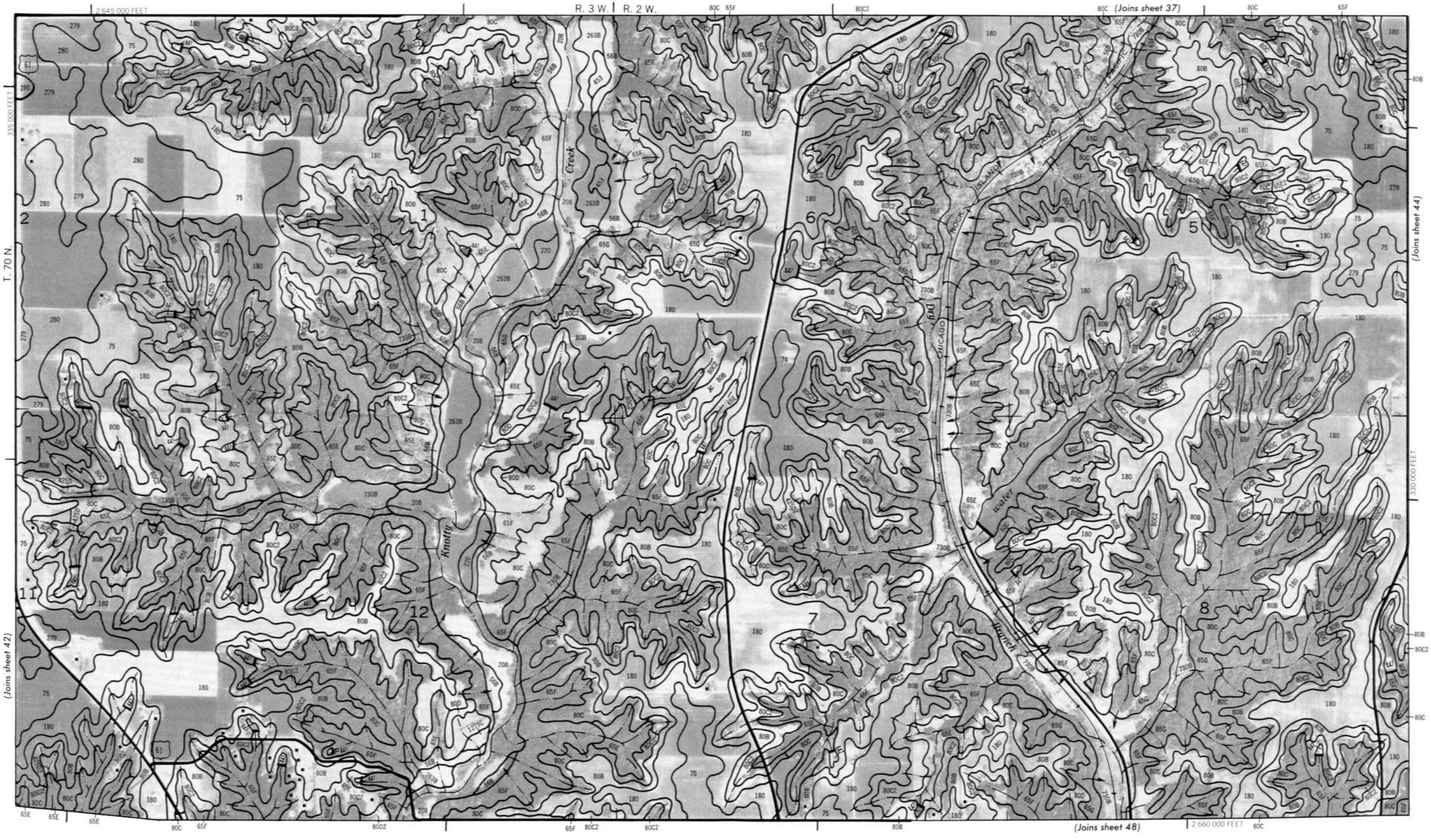
0 1/4 0.5 1/2 1 3/4

FLINT CREEK

FLINT CREEK

water

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 43



SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 44

(44)

N

R. 2 W.

2 680 000 FEET

335 000 FEET

T. 70 N.

(Joins sheet 38)

(Joins sheet 43)

(Joins sheet 49)

(Joins inset sheet 33)

YELLOW

SPRING

CREEK

int

water

Little Rag Island

MISSISSIPPI RIVER

Trienes Bar

Turtle Island

HENDERSON CO.

ILL.

1 MILE

1 KILOMETER

Scale 1:15 840

0 0.5 0

1/4 1/2 3/4 1

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 45

2 590 000 FEET

R. 4 W.

(Joins sheet 40)

T. 70 N.

320 000 FEET

HENRY COUNTY

(Joins sheet 46)

Danville

BURLINGTON

NORTHERN

Cedar Creek

Crooked Creek

GEODE STATE PARK

SEWAGE LAGOON

17

16

15

18

19

20

21

22

(Joins sheet 50)

315 000 FEET

2 605 000 FEET

N

MILE

KILOMETER

Scale 1:15 840

46

N

MILE

KILOMETER

(Joins sheet 45)

Scale 1:15 840

0 1/4 0.5 1/2 3/4 1

(Joins sheet 41)

R. 4 W. | R. 3 W.

2 625 000 FEET

325 000 FEET

T. 70 N.

315 000 FEET

2 610 000 FEET

(Joins sheet 51)

(Joins sheet 47)

BURLINGTON

NORTHERN

Little Flint Creek

S.L.

14 15 22 23 13 18 19 24

34

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 47

(48)

N

R. 3 W. | R. 2 W.

(Joins sheet 43)

(Joins sheet 47)

(Joins sheet 53)

(Joins sheet 49)

T. 70 N.

2 660 000 FEET

2 645 000 FEET

315 000 FEET

325 000 FEET

Scale 1:15 840

1 MILE

1 KILOMETER

0 0.5 1

1/4 1/2 3/4

FLINT CREEK

STARR'S CAVE

FLINT HILLS PARK

DRY ROCK ISLAND Branch

CHICAGO

PACIFIC

13 14 18 17 24 23 19 20

N

1 MILE

1 KILOMETER

Scale 1:15 840

(Joins sheet 44)

R. 2 W.

2 665 000 FEET

325 000 FEET

T. 70 N.

(Joins sheet 48)

320 000 FEET

2 680 000 FEET

(Joins sheet 54)

Turtle Island

Little Turtle Island

Hogback Island

RIVER

OTTER SLOUGH

OTTER ISLAND

Dumbell Lake

15

16

21

O'CONNELL ISLAND

O'CONNELL Branch

Dry

SLOUGH

RUSH CHUTE

Rush Island

Otter Bay

MISSISSIPPI RIVER

HENDERSON COUNTY ILLINOIS

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 50

(50)

N

1 MILE

1 KILOMETER

COUNTY

HENRY

Scale 1:15 840

0 1/4 0.5 1/2 1 3/4

(Joins sheet 45)

R. 4 W.

T. 70 N.

2 605 000 FEET

310 000 FEET

305 000 FEET

2 590 000 FEET

(Joins sheet 55)

(Joins sheet 51)

Cedar Creek STATE PARK

Long Creek

IOWA ARMY AMMUNITION PLANT

30 29 28 27 31 32 33 34

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 51

51

N

R. 4 W. R. 3 W.

2 610 000 FEET

T. 70 N.

310 000 FEET

(Joins sheet 46)

(Joins sheet 52)

(Joins sheet 50)

(Joins sheet 56)

2 625 000 FEET

305 000 FEET

BURLINGTON

NORTHERN

Middletown

IOWA ARMY AMMUNITION PLANT

27 26 25 30 34 35 36 31

1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 0.5 1/2 1 3/4 1

52

N

R. 3 W.

T. 70 N.

2 640 000 FEET

310 000 FEET

305 000 FEET

1 MILE

1 KILOMETER

Scale 1:15 840

0 0.5 0 1/4 1/2 3/4 1

(Joins sheet 47)

(Joins sheet 51)

(Joins sheet 53)

(Joins sheet 57)

29 28 27 26 32 33 34 35

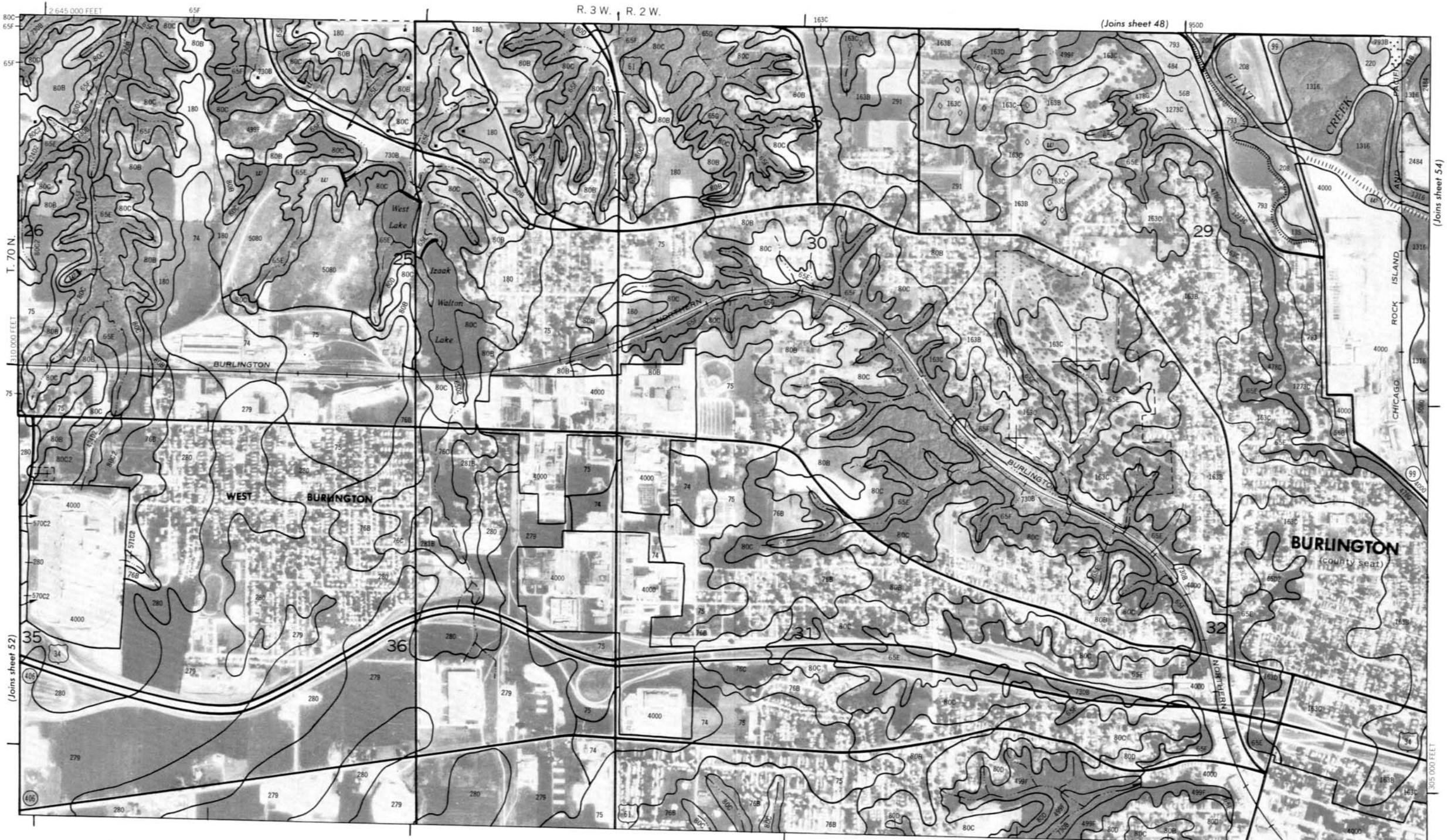
BURLINGTON NORTHERN

IOWA ARMY AMMUNITION PLANT

Brush Creek

Spring Creek

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 53



54

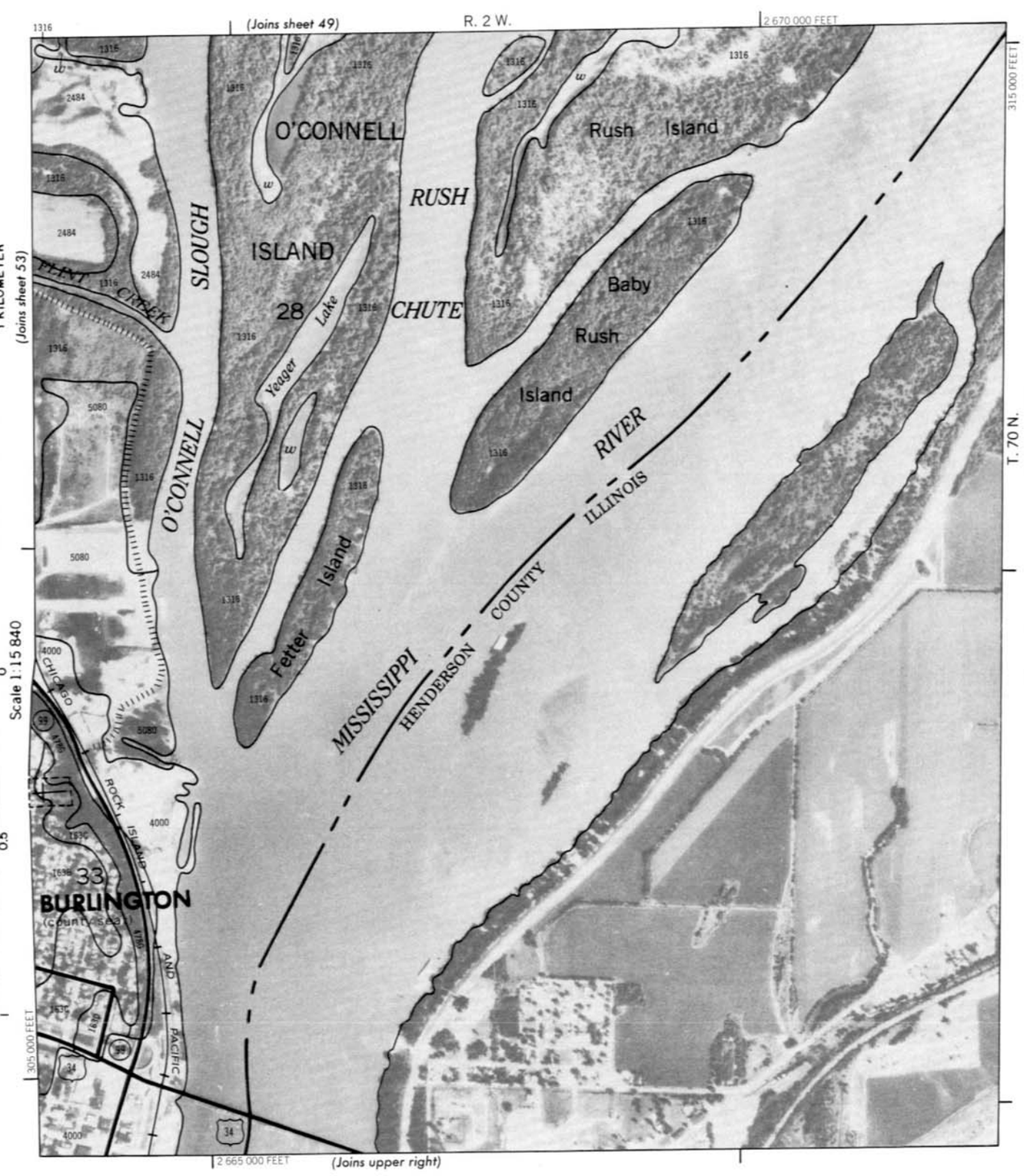
N

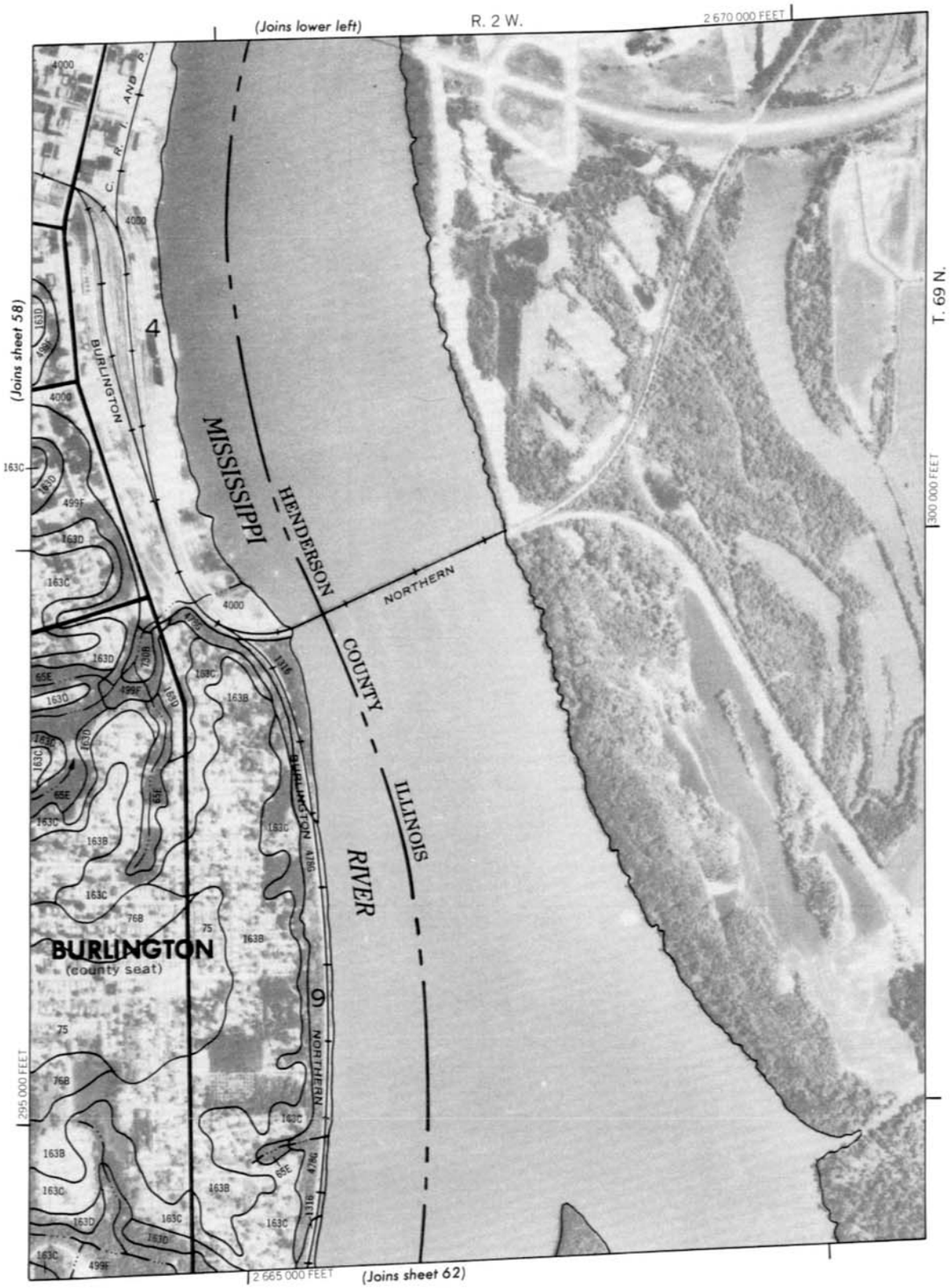
1 MILE

1 KILOMETER

Scale 1:15 840

0 0.5 1/4 1/2 3/4 1





SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 55

55

N

R. 4 W.

T. 69 N.

2 590 000 FEET

2 605 000 FEET

300 000 FEET

295 000 FEET

(Joins sheet 50)

(Joins sheet 56)

(Joins inset A, sheet 63)

(Joins inset B, sheet 63)

SKUNK RIVER

LEE COUNTY

IOWA

ARMY

Creek

AMMUNITION

PLANT

water

1 MILE

1 KILOMETER

Scale 1:15 840

(56)

N

R. 4 W. | R. 3 W.

2 625 000 FEET

T. 69 N.

300 000 FEET

(Joins sheet 51)

(Joins sheet 55)

(Joins sheet 57)

(Joins sheet 59)

2 610 000 FEET

295 000 FEET

IOWA ARMY AMMUNITION PLANT

Long Creek

Long Creek

water

water

Scale 1:15 840

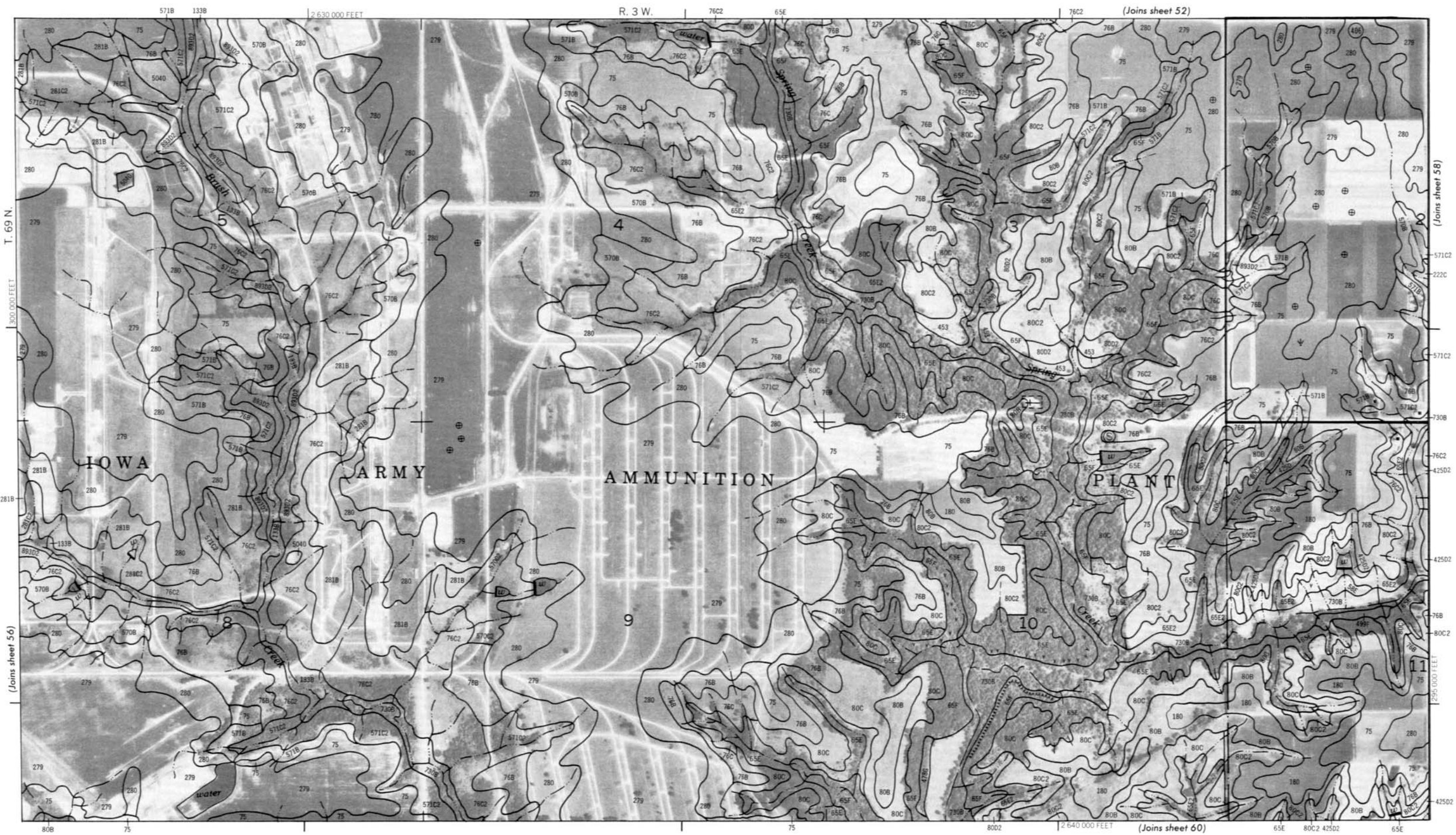
1 MILE

1 KILOMETER

0 0.5 1

1/4 1/2 3/4

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 57



SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 58

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 59

59

N

R. 4 W. R. 3 W.

(Joins sheet 56)

2 610 000 FEET

290 000 FEET

T. 69 N.

IOWA ARMY AMMUNITION PLANT

13 14 15 18 19 23 24

SKUNK RIVER

LEE COUNTY

Long Creek

water

Augusta

LOWER AUGUSTA SKUNK RIVER ACCESS

(Joins sheet 60)

(Joins inset B, sheet 63)

(Joins sheet 63)

265 000 FEET

2 625 000 FEET

1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 60

(60)

N

MILE

KILOMETER

Scale 1:15 840

0 0.5 1

1/4 1/2 3/4

(Joins sheet 57)

(Joins sheet 59)

(Joins sheet 64)

(Joins sheet 61)

R. 3 W.

T. 69 N.

2 640 000 FEET

2 630 000 FEET

285 000 FEET

290 000 FEET

IOWA AMMUNITION PLANT

ARMY

Brush Creek

Spring Creek

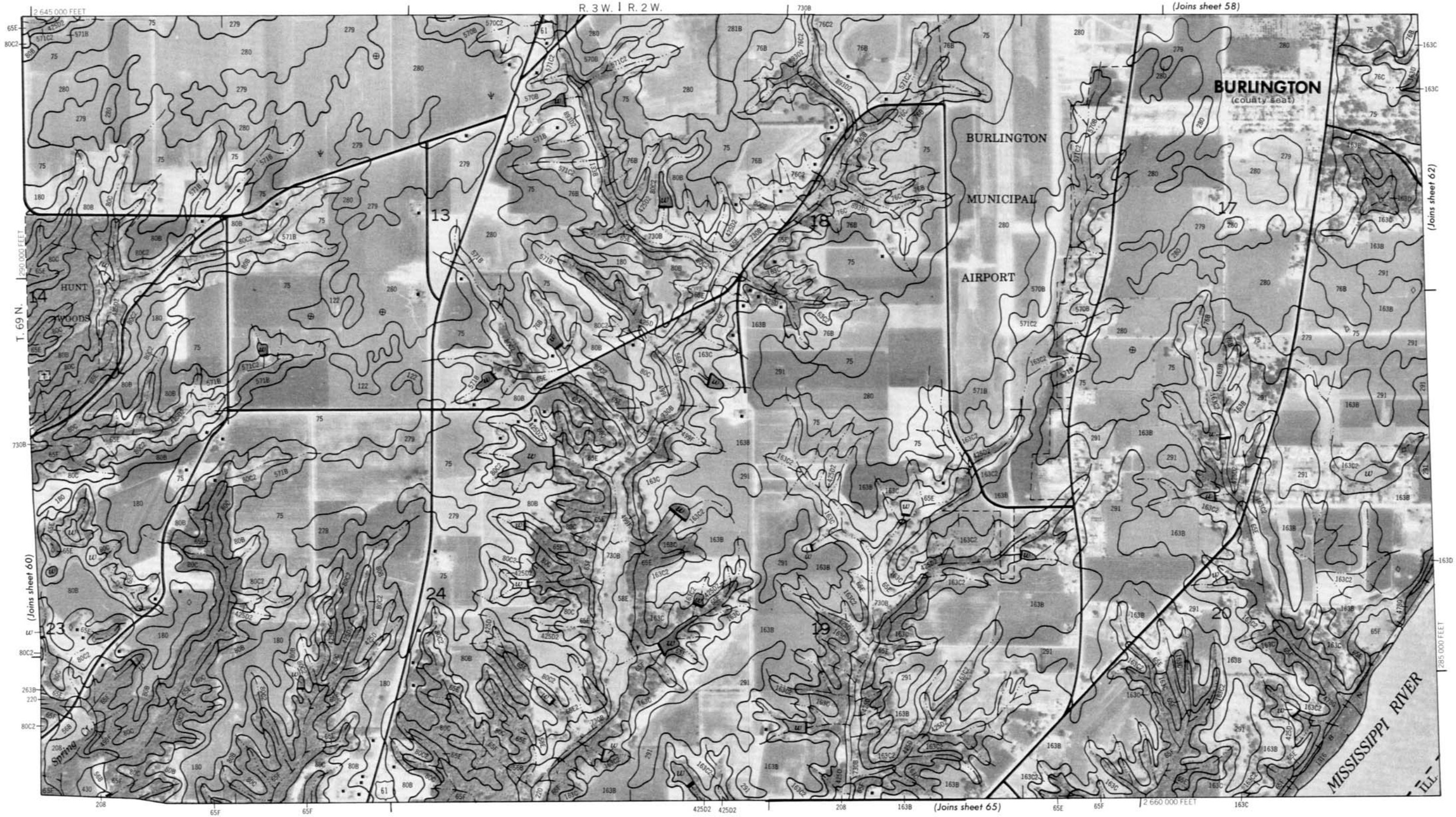
Brush Creek

Spring Creek

17 16 15 14

20 21 22 23

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 61



62

N

1 MILE

1 KILOMETER

(Joins inset, sheet 54)

(Joins sheet 61)

(Joins sheet 64)

R. 3 W.

T. 69 N.

T. 68 N.

(Joins sheet 66)

BURLINGTON
(county seat)

RIVER

ILLINOIS

MISSISSIPPI

HENDERSON COUNTY

SKUNK RIVER

LEE COUNTY

water

Scale 1:15 840

0 0.5 1

0 1/4 1/2 3/4 1

2 680 000 FEET

2 645 000 FEET

270 000 FEET

290 000 FEET

285 000 FEET

265 000 FEET

2 635 000 FEET

2 665 000 FEET

4000 AND 5000 FOOT GRID TICKS

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 63

63

N

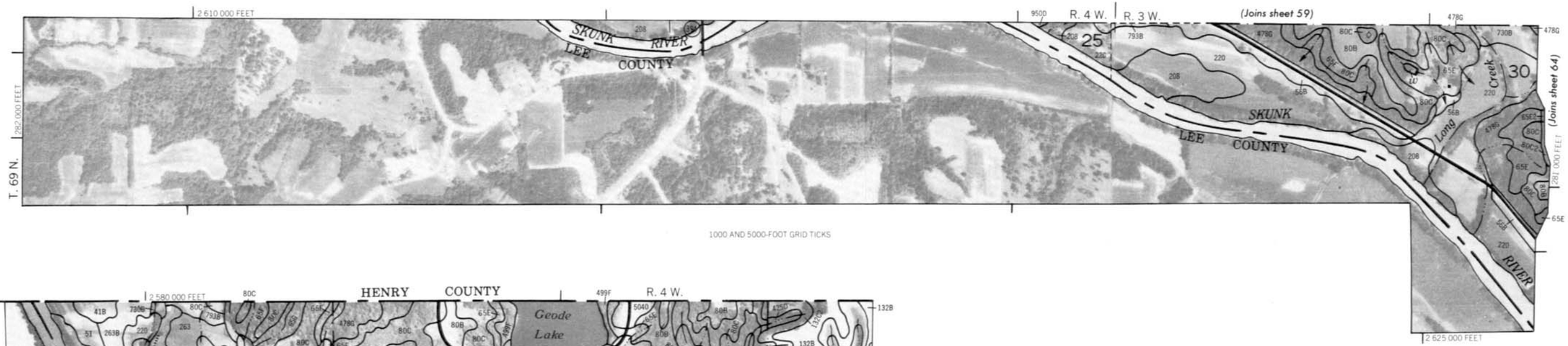
MILE

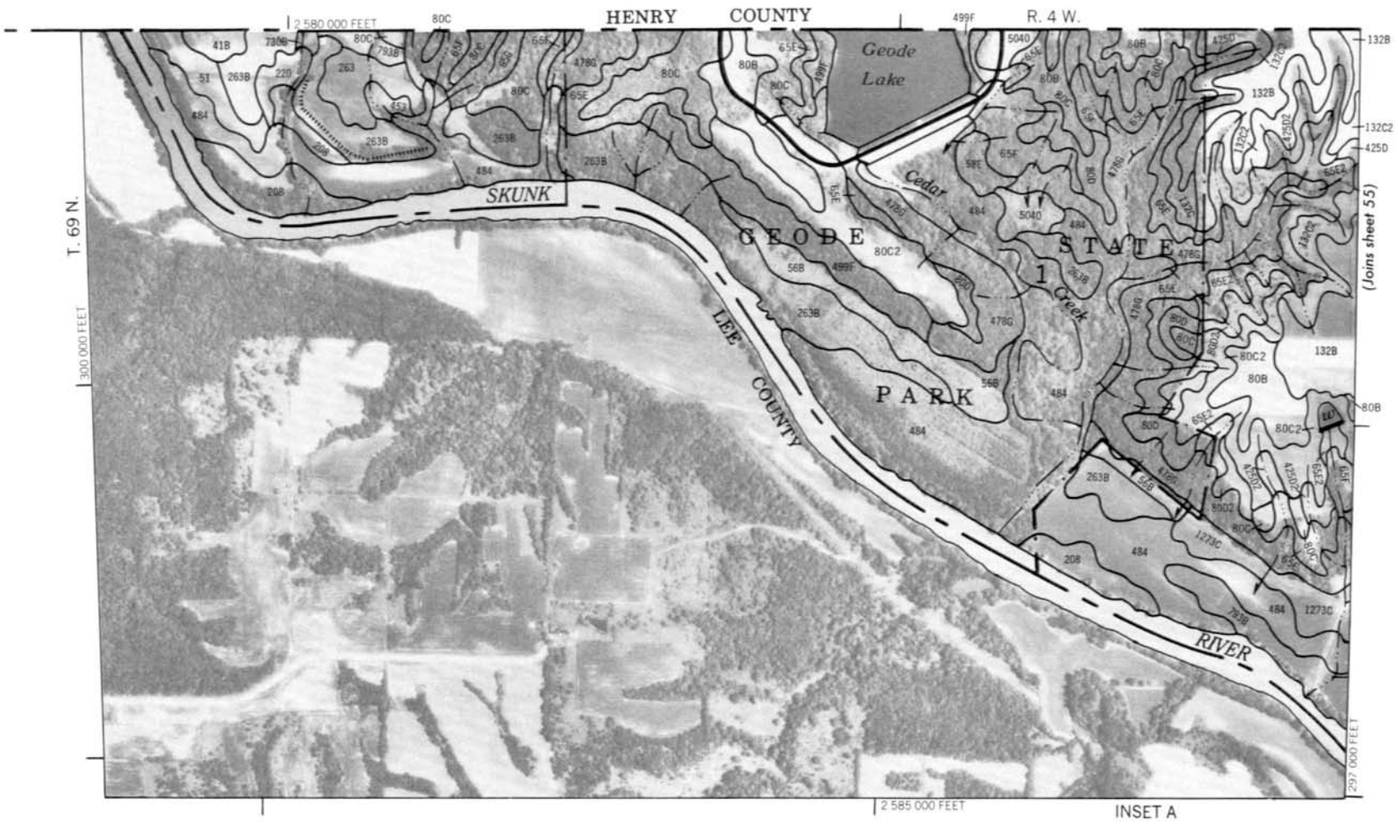
KILOMETER

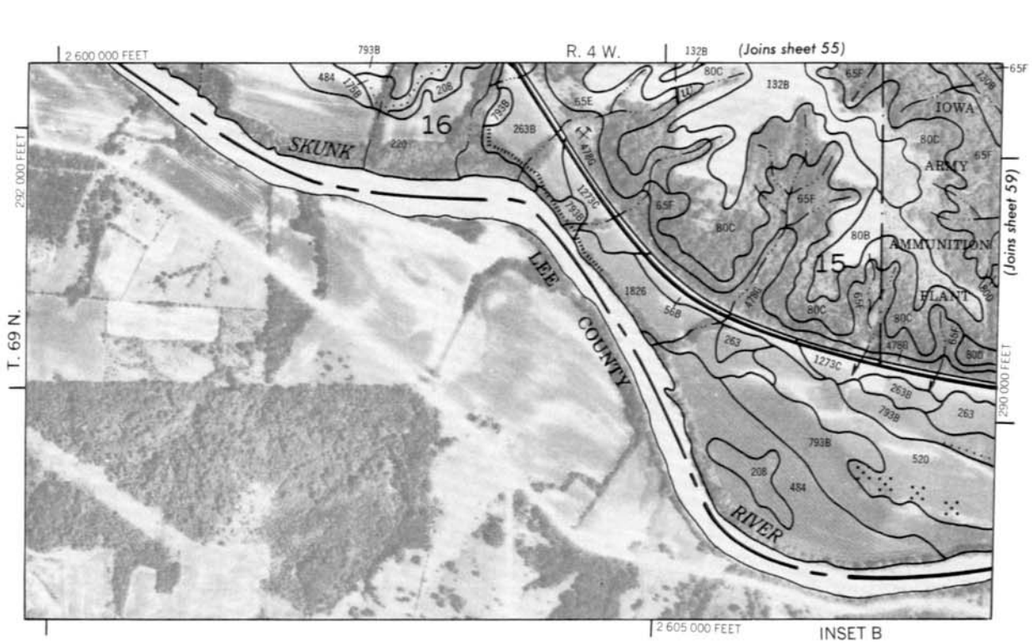
Scale 1:15 840

0 1/4 1/2 3/4 1

0 0.5 1







SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 64

64

N

MILE

KILOMETER

Scale 1:15 840

(Joins sheet 60)

(Joins sheet 63)

(Joins inset, sheet 62)

(Joins sheet 65)

R. 3 W.

T. 69 N.

2 645 000 FEET

280 000 FEET

275 000 FEET

2 630 000 FEET

SKUNK RIVER

LEE COUNTY

BURLINGTON NORTHERN

Brush Creek

29

28

27

26

32

33

34

35

SOIL MAP OF DES MOINES COUNTY, IOWA — SHEET NUMBER 65

65

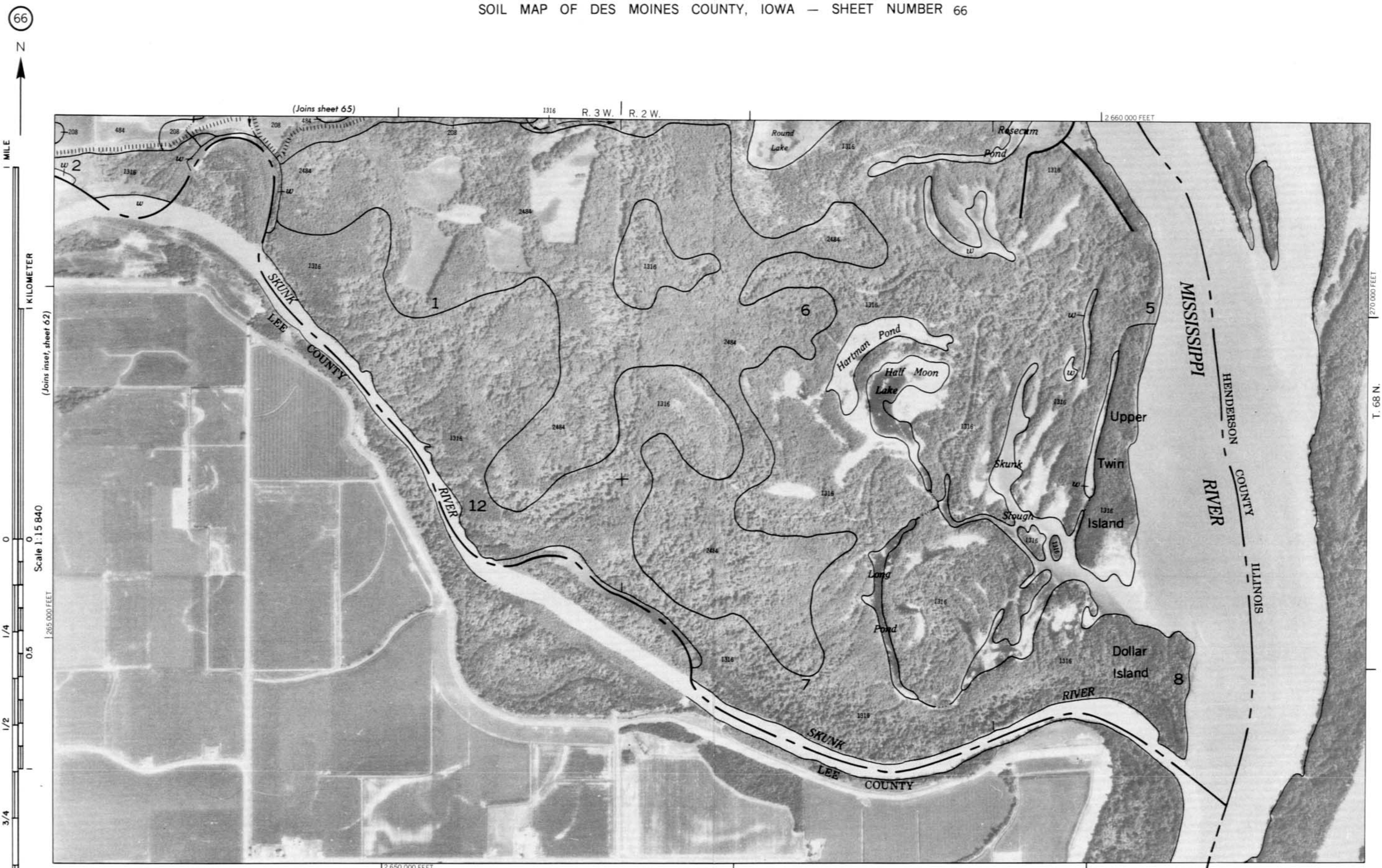
N

1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 0.5 1/2 3/4


66
N
(Joins sheet 65)
R. 3 W.
R. 2 W.
2 660 000 FEET
270 000 FEET
T. 68 N.
MILE
KILOMETER
(Joins inset, sheet 62)
Scale 1:15 840
265 000 FEET
2 650 000 FEET
SKUNK RIVER
LEE COUNTY
Round Lake
Rosecum Pond
Hartman Pond
Half Moon Lake
Long Pond
Skunk Slough
Upper Twin Island
Dollar Island
MISSISSIPPI RIVER
HENDERSON COUNTY
ILLINOIS
1
2
5
6
7
8
12
1316
2484
208
484
w